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Original Contributions.

OSSIFICATION OF THE LOWER JAW IN MAN.

BY EDWARD FAWCETT, M.B. (EDIN.), BRISTOL, ENG. READ BEFORE THE SECTION ON STOMATOLOGY, AMERICAN MEDICAL ASSOCIATION, 1905, AND PUBLISHED BY COURTESY OF THE JOURNAL OF THE ASSOCIATION.

From the fact that there are so many different accounts given of the ossification of the lower jaw, it is evident that the question is in need of reinvestigation. Nothing more recent than Bland-Sutton's account seems to have been published on the subject, and that is based on work apparently done in 1883, and, as will be seen, it can be by no means considered conclusive.

It is necessary to state the various accounts as the recognized text-books give them in order to appreciate the great diversity of opinion which exists.

If we begin with Quain, we find the following statement: "The largest part of each half is formed from a deposit (dentary) in the membrane on the outer side of Meckel's cartilage, and to this there is added a second smaller plate (splenial) which forms the inner walls of the tooth sockets, terminating behind in the lingula. A small part of the body by the side of the symphysis results from the direct ossification of the anterior end of Meckel's cartilage; and, posteriorly, the condyle and a portion of the ramus, including the angle, are developed from another ossification in cartilage."

Macalister says: "One center of ossification begins in the embryonic tissue around Meckel's cartilage on the thirty-eighth day. A supplemental patch of cartilage appears in this tissue at the angle and a second at the condyle. Centers of ossification, condylar and angular, arise in each of these patches, and a third in the median end of Meckel's cartilage; a fifth or splenial center

arises in the lingula. These all very rapidly unite, so that by the fourteenth week but one bony mass is present on each side."

Kollman, who quotes Toldt, Stieda and Schafer, says that the anlage of the lower jaw can be seen in an embryo of 30 mm. from neck to tail. The ventral site of union of both Meckel's cartilages is surrounded by bony lamellæ, which arise, not out of cartilage, but out of mesoderm and develop upward, following Meckel's cartilage. They form at the side two bony lamellæ, which come together dorsally, and between the lamellæ runs the inferior dental nerve. Further upward, the bone becomes thinner, to again thicken in the neighborhood of the auditory capsule. There are few places where one can so clearly observe the independence of covering bone from that arising from cartilage. Further, the

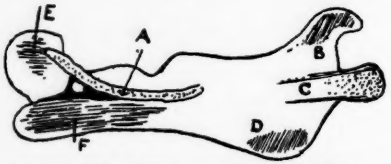


Fig. 1.—Scheme after Sutton. E. Mento-Meckelian center. F. Dentary A. Splenial. B. Coronoid. C Condyle. D. Angular.

origin of the jaw becomes complicated through the appearance of hyaline cartilage, which arises secondarily, quite independently of Meckel's cartilage. This occurs in the region of the central incisor tooth from the upper external alveolar border as far as the region of the cuspid tooth and on the coronoid and condyloid processes.

In the fetus of from 15 to 18 cm., only traces (of cartilage) are present, and these accessory nuclei have only a provisional significance. They atrophy, owing to the formation of new bony tissue, just as does Meckel's cartilage. Fresh researches are required to determine whether these ossifications have any phylogenetic meaning.

In "Gray's Anatomy," in the article edited by Howden, the following statements are made:

"The lower jaw is developed principally from membrane, but partly from cartilage. The process of ossification commences early, earlier than any other bone except the clavicle. The greater part of the bone is formed from a center of ossification (dentary)

which appears between the fifth and sixth weeks in the membrane on the outer surface of Meckel's cartilage. A second center (splenial) appears in the membrane on the inner surface of the cartilage, and from this center the inner wall of the sockets of the teeth is formed; this terminates above in the lingula. The anterior extremity of Meckel's cartilage becomes ossified, forming the body of the bone on each side of the symphysis. Two supplemental patches of cartilage appear at the condyle and at the angle, in each of which a center of ossification for these parts appears; the coronoid process is also ossified from a separate center. At birth the bone consists of two halves united by a fibrous symphysis in which ossification takes place during the first year."

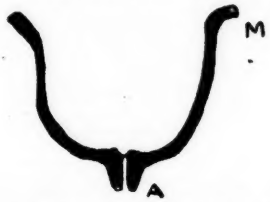


Fig. 2.—Scheme of Meckel's cartilage: M, malleus end; A, anterior end.

In Cunningham's "Text-book of Anatomy," p. 141, we find it stated that:

"The development of the lower jaw is intimately associated with Meckel's cartilage, the cartilaginous bar of the first visceral or mandibular arch. Meckel's cartilages, of which there are two, are connected proximately with the periotic capsule and cranial base. Their distal ends are united in the region of the symphysis. It is from the connective tissue overlying the outer surface of the cartilaginous arch that the bulk of the lower jaw is developed. The cartilage itself is not converted into bone, but undergoes resorption, except at its anterior extremity, which is stated to undergo ossification to form the part of the jaw lying between the mental foramen and the symphysis. In a third or fourth month fetus, the cartilage can be traced from the under surface of the forepart of the tympanic ring downward and forward to reach the jaw, to which it is attached at the opening of the inferior dental canal; from this it may be traced forward as a narrow strip applied to the inner surface of the mandible which it sensibly grooves. The

proximal end of this furrow remains as the mylo-hyoid groove. The part of the cartilage between the tympanic ring and the jaw becomes converted into fibrous tissue and persists in the adult as the so-called internal lateral ligament of the temporo-maxillary articulation, its proximal end through the Glaserian fissure being continuous, with the slender process of the malleus. The part which is applied to the lower jaw disappears. In the tissue overlying the cartilage ossification begins by several centers as early as the sixth or seventh week of fetal life, in this respect resembling the clavicle, by which it is alone preceded. The dentary or basal

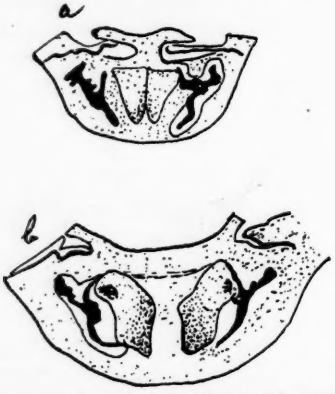


Fig. 3.—(a) Coronal section of anterior end of Meckel's cartilage. (b) Coronal section a little behind anterior end of Meckel's cartilage.

center forms the outer wall and lower border. With this is united the splenial portion, which appears somewhat later, forming the inner table from near the symphysis backward, toward the opening of the inferior dental canal, where it terminates in the lingula. By the union of these two parts a groove is formed, which ultimately becomes covered in, and in which the inferior dental nerves and vessels are lodged. As has already been stated, the part of the body between the symphysis and the mental foramen is regarded as directly developed from the forepart of the Meckelian cartilage. As will have been gathered from the above description, the upper part of the ramus and its processes have no connection with Meckel's cartilage; the condyle and the coronoid process are each developed from a separate center, preceded by a cartilaginous

matrix. These several centers are all united about the fourth month."

Sappey describes very carefully Meckel's cartilage and, in addition, gives an account of the ossification of the lower jaw. He says:

"The lower jaw appears at the commencement of the second month of intrauterine life in the form of a small ogival arch, composed of two symmetrical and continuous halves. This arch of parabolic figure constitutes the cartilage of Meckel. * * * Situated on the internal face of the bone below the mylo-hyoid ridge,

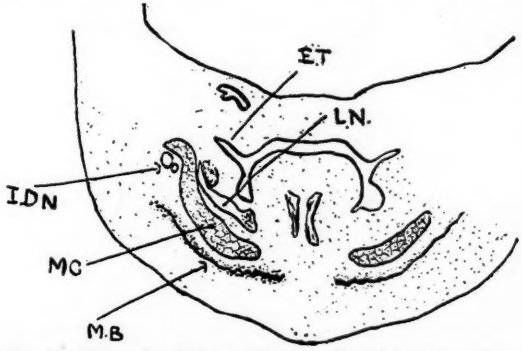


Fig. 4.—(Harvard collection, 852, H., 129). Horizontal section of 21 mm. embryo. M. C. Meckel's cartilage; I. D. N., inferior dental nerve; L. N., lingual nerve; E. T., Eustachian tube; M. B., membrane bone.

Meckel's cartilage presents the appearance of a long ribbon extended between the symphysis and the front of the tympanum. By their internal extremities the two cartilages are continuous; they form thus an arcade of which the median part sends a prolongation between the two halves of the maxilla. Their external extremity projects beyond the corresponding bony part and applies itself to the anterior part of the tympanic ring and penetrates into the cavity of the tympanum. . . . Ultimately Meckel's cartilage disappears, first in its intermediate part, then at its anterior extremity; only the posterior part remaining as the malleus and incus. In front of the cartilage of Meckel appear two centers of ossification in a cartilage not well known, one right, the other left, toward the thirty-fifth day. They extend rapidly along the whole length of each half of the bone."

Testut, who quotes from Kolliker, Brock, Masquelin and Julin, says that the lower jaw is primitively double, that each half is developed quite independently of the other, and that the bone which covers it does so just as the bones of the membranous cranium cover the primitive chondrocranium. He states, too, that the osseous condyle is preceded by a cartilaginous condyle. Thus, each half is a mixed bone, developing partly from embryonic connective tissue and partly from pre-existing cartilage. Agreement on this point is not complete and the method of development of

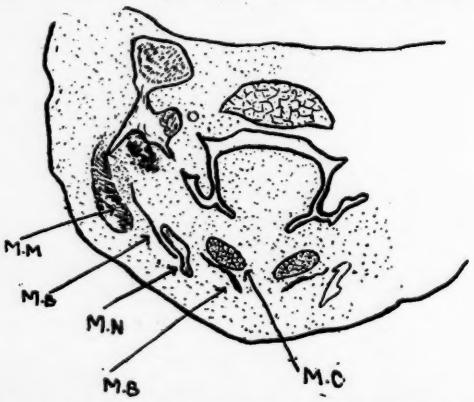


Fig. 5.—(Harvard collection, 852, G., 112.) Horizontal section of 21 mm. embryo. M. C., Meckel's cartilage; M. N., mental nerve; M. B., membrane bone; M. M.

the mandible, especially that of the condyle, requires new researches.

Testut states that, according to Rambaud and Renault, each half of the jaw has six ossific centers visible from the fiftieth day of intrauterine life.

1. The inferior point (visible at the thirtieth or thirty-fifth day), a small train of osseous granules, situated toward the inferior border of the bone.

2. The invisive point, situated on each side of the symphysis in the region which the incisors will occupy later.

3. The supplementary point of the mental foramen, which helps by its inferior surface to form the mental foramen.

4. The condyloid point, which will form the condyle and subjacent portion of the ramus.

5. The coronoid point, out of which will develop the coronoid process and the portion of the ramus which forms its base.

6. The point forming the spine of Spix, situated on the posterior surface of the bone from the superior orifice of the future.

According to Cruveilhier the inferior maxilla is developed by two points of ossification, one for each lateral half. Autenrieth admits, in addition, three complementary points, one for the condyle, one for the coronoid process and one for the angle, but I have never observed them. The case is different, how-

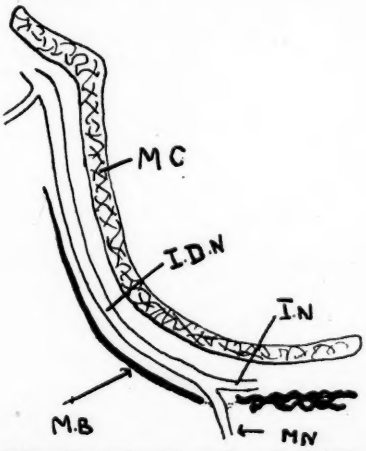


Fig. 6.—Schematic horizontal section of Meckel's cartilage; the inferior dental nerve. I. D. N., and the membrane bone, M. B. M. C., Meckel's cartilage; M. N., mental nerve.

ever, with a point of ossification described and figured by Spix, which forms the inner side of the alveolar border or rather of the dental canal. In a fetus of about fifty or sixty days, I have seen a kind of bony spiculum which passed along the internal surface of the body and ramus of the bone. On one-half of the maxillary bone this spiculum was entirely free, but that of the other side adhered by the internal third of its length. The spine which surmounts the dental canal is nothing more than the extremity of this bony spiculum. It follows, therefore, that the inferior maxilla is developed from four points of ossification. The inferior maxilla takes precedence of all the bones of the head in its development and, indeed, of all the bones

of the skeleton, except the clavicle. The inferior edge of the body of the bone appears as early as the thirtieth or thirty-fifth day. This extends backward to form the ramus and forward to form the portion which supports the incisor teeth. It is probable that the osseous point of the dental canal, mentioned above, appears at the same time. At a later period the groove becomes very considerable and is divided into alveoli by septa which at first are incomplete, but afterward become perfect; the alveoli and their septa occupy at this time the entire depth of the bone.

The point of ossification described by Spix is united to the rest

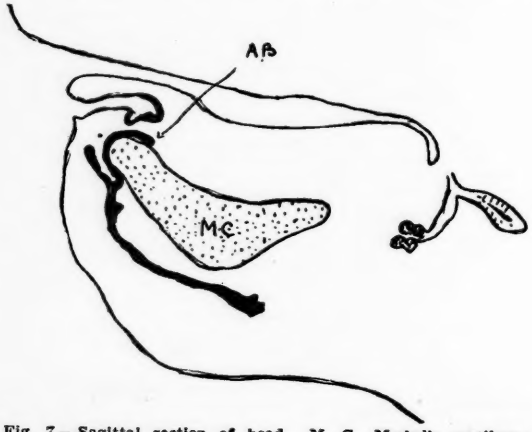


Fig. 7.—Sagittal section of head. M. C., Meckel's cartilage; A. B., alveolar border.

of the bone from the fifteenth to the sixteenth day. (Spix affirms that it remains separate until the fourth month.) The two halves of the maxilla are joined together during the first year after birth. The traces of this union exist for some time, but are afterward effaced in the lower animals; the suture remains throughout life.

According to Humphry, "ossification commences in the membrane from which the inferior maxilla is formed at a very early period, from the thirtieth to the thirty-fifth day, according to Beclard. Soon after two months it is considerably advanced. The bone is then in two halves, united in the median line by membrane. In each of these halves the condyle, coronoid portion and angle are quite evident, the mental part is of considerable

size, and there is a lamina appended to the inner side of the ramus, which, shooting upward, forms the inner wall of the dental groove and dental canal. The appearance of the several parts at this early stage certainly gives countenance to the supposition that each of them had a separate ossifying nucleus, corresponding, or nearly corresponding, with the five pieces into which the jaw of the crocodile is permanently divided; that is to say, one for the under and outer part of the ramus, another for the inner alveolar border, a third for the coronoid process, a fourth for the condyle, and a fifth for the angle. If it be so they become united very quickly after their formation. The probability,

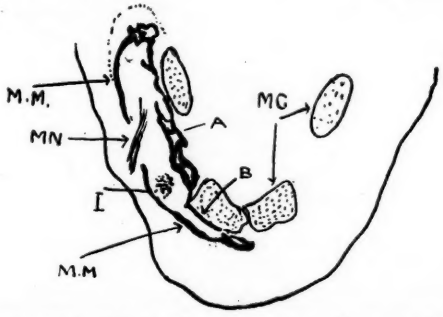


Fig. 8.—Horizontal section of 42 mm. embryo showing the growth of the inner alveolar border. M. M., primitive membrane bone; M. N., mental nerve; I., canine tooth; A., inner alveolar border; B., inner segment of that border; M. C., Meckel's cartilage.

however, is that in this bone, as in the upper jaw, there is usually only one nucleus on either side and that the various processes are merely outgrowths; the instances in which the latter are developed from the separate nuclei being exceptional."

Kerkringius describes the coronoid process as consisting, up to the third month, of an ossicle, separated by a suture from the rest of the maxilla. Beclard mentions, in addition to the nucleus for the ramus, which appears from the thirtieth to the thirty-fifth day, a nucleus for the coronoid process, which appears about the forty-fifth day. Autenrieth and Spix describe also a nucleus for the condyle and one for the angle, to the probability of which Beclard gives assent. According to Spix, the inner wall of the jaw is derived from a separate nucleus. Blandin found the body,

the coronoid process and the posterior part of the bone separate from one another in a fetus of three months. As growth proceeds, the inner lamina of the ramus rises nearly to the same level with the outer and forms the inner alveolar border; the dental groove is deepened.

Near the coronoid process the inner lamina joins the outer, arching over and inclosing the dental foramen and the posterior part of the dental canal. The latter is at this time a mere channel in which the nerves and vessels lie, at the bottom of the dental groove, in the greater part of its extent.

Cleland says: "The lower jaw is, next to the clavicle, the earliest bone to show osseous deposit. It is developed round Meckel's cartilage, mainly outside of it, but additional centers have been

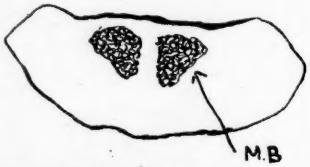


Fig 9.—(Harvard collection, 819, Q., 233.) Coronal section of 19 mm. embryo; M. B., membrane bone.

noted at the lingula, at the angle, at the coronoid process and at the condyle. The condyle is laid down in cartilage before its ossification begins, but the supposition that Meckel's cartilage is in any part converted into osseous tissue of the jaw is erroneous."

Holden says: "Each lateral half of the lower jaw is represented in the early fetus by what is called the 'first visceral arch or cartilage of Meckel.' In the process of development, the proximal part of this cartilage is converted into the 'malleus' bone of the middle ear. The distal part, mostly by the growth of bone round the cartilage, but slightly by a direct ossification of the cartilage itself, is converted into one-half of the lower jaw. The part between these two end portions becomes the 'internal ligament' of the temporomaxillary articulation. The bony lower jaw begins tc be formed, with perhaps the exception of the clavicle, earlier than any other bone in the body. For each of the lateral halves of the bone, we find that several osseous nuclei appear about the sixth week of fetal life in the membrane which invests Meckel's cartilage. The smaller plate forms the inferior dental canal and

the inner wall of the sockets of the teeth. The symphysis end of each half of the body is formed by a direct ossification of the corresponding part of Meckel's cartilage. The condyle and part of the vertical ramus are formed by ossification of cartilage not connected with Meckel's, and the junction of the two lateral halves of the body at the symphysis does not take place until the first year after birth."

In 1883 Bland-Sutton published a paper giving a very excellent and concise résumé of the work which had already been done on the subject and gave also the results of his own observations. He says: "The examination of numerous specimens of human maxillæ from the sixth week onward has convinced me that the

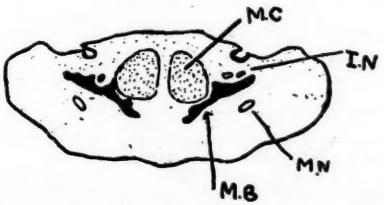


Fig. 10.—(Harvard collection, 819, P., 323.) Coronal section of 19 mm. embryo; M. C., Meckel's cartilage; M. B., membrane bone; M. N., mental nerve; I. N incisive branch of mental nerve.

lower jaw arises from six distinct centers of ossification, five of of them answering exactly to those described by Spix, the sixth representing the mento-Meckelian center of Callender.

"So far as I have been able to observe, the nucleus marked F. in Figure 1 is the first to appear; from this center the larger part of the body of the bone is formed. At first it resembles a shallow trough lodging the cartilage.

"The nuclei for condyle, coronoid and angle follow so rapidly that it is difficult to determine their order. About the same time, osseous granules may be seen in the perichondrium surrounding the distal end of Meckel's cartilage, gradually invading its substance.

"As soon as the various centers make their appearance, a thin network of osseous tissue quickly connects them. When this occurs a thin shelf of bone will be found immediately above Meckel's cartilage and the inferior dental nerve. This latter osseous streak lies on the inner side of the developing bone, quite distinct

from the other centers, and represents the splenial. Now is the very best time to observe the various nuclei, particularly if the bone is rendered transparent by means of alcohol and oil of cloves. Its appearance is very striking. The bone presents the familiar shape of the fetal jaw, but its texture reminds one of a spider's web, the various centers showing like flies entangled in the mesh. (Fig. 1.)

"The order of events may be arranged in stages for the sake of clearness thus:

1. Meckel's cartilage appears.
2. Dentary is seen below.
3. Centers for condyle, coronoid, angle and mento-Meckelian.

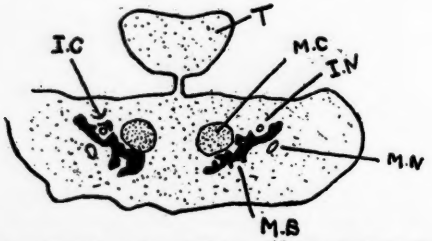


Fig. 11.—Coronal section of 19 mm. embryo; in front of mental foramen: incisor canal is just forming: M. B., membrane bone; M. N., mental nerve; I. N., incisive nerve; T. tongue; M. C. Meckel's cartilage.

4. Network of osseous tissue connects them together.
5. Splenial appears as ledge of bone supporting teeth.
6. Disappearance of Meckel's cartilage from jaw, and fusion of splenial.

"The splenial element is interesting on account of its relation to the developing teeth. On its first appearance it stands out at right angles to the dentary, serving to separate the teeth germs from Meckel's cartilage. If, at the fourth month of intrauterine life, the tissues on the inner side of the jaws be carefully dissected away, the splenial will be observed forming a distinct ledge of bone, supporting on its superior surface the dental follicles like flasks on a shelf; immediately beneath it runs Meckel's cartilage and the nerve. As the cartilage atrophies, the splenial extends downward to fuse with the dentary immediately below the nerve; in this way the mylohyoid branch gets shut off from the

main portion of the inferior dental nerve. After the fourth month it extends vertically to form the inner wall of the maxilla, all trace of its originally separate condition being thus completely lost, the bone then assuming the condition, which it presents at birth, with which we are all so familiar.

"Let me now offer evidence of a different character of the compound nature of this bone. In the year 1814, the celebrated French anatomist, Serres, in a paper read before the Académie des Sciences, Paris, propounded certain laws bearing on ossification. Among them was one termed the 'Loi de Conjugaison,' by which he showed the various foramina in bones to result from the op-

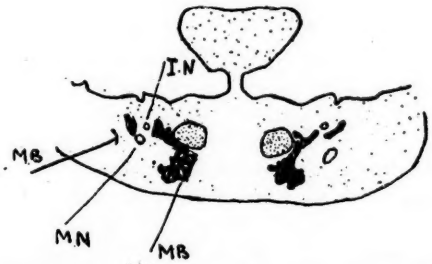


Fig. 12.—(Harvard collection, 810, P., 313.) Coronal section of 19 mm. embryo through mental foramen; M. N., mental nerve; I. N., incisive nerve.

position of two or more distinct bones or distinct centers of ossification. To this law there were many exceptions; among the more unstable were certain foramina in the temporal bone and the inferior dental foramina.

"When I first took up the subject of nerve foramina, Serres' researches were quite unknown to me, and I took as my guide this rule: 'Whenever a nerve passes through a bone it marks the confluence of two or more ossific centers.' Among the earliest bones to yield under this method of analysis were the temporal and the inferior maxilla; later I became acquainted with Serres' paper, the greater part of which is published as a footnote in the French traduction of Meckel's 'Anatomie Comparée,' vol. iv. Much to my satisfaction I found that my method had yielded far more satisfactory results and had banished two of the apparently most obvious exceptions to the law, and it is most interesting

to trace out the intricate pathways by which many nerves quit the cranial cavity in order to avoid piercing an ossific center.

"Applied to the lower jaw, the rule stands thus: The nerves concerned are the inferior dental, mental and mylohyoid. The inferior dental enters by the foramen of the same name, formed by the coalescence of the coronoid, condyloid, dentary, angular and splenial elements; the nerve then travels in a tunnel formed on the outer side of the dentary and on the inner side of the splenial. The mental branch passes out through a fenestrum formed by dentary and mento-Meckelian ossification.

"The mylohyoid runs in the groove which once lodged Meckel's cartilage, the sulcus, also corresponding to the junction of splenial with dentary. As the inferior dental passes along the canal, it sends up twigs to the teeth, and these twigs occupy foramina or spaces between the splenial and dentary. The relation of nerves thus lends additional help in unraveling the mystery."

Mr. Sutton, from this point, proceeds to the comparative side of the question, quoting the condition in the dogfish, the sturgeon, the *ganoid amia,* the cod, amphibia and reptiles. He finally gives a table of homologies thus:

HOMO.	FISH.
Mento-Meckelian.	Mento-Meckelian.
Angle.	Angular.
Condyle.	Articular.
Coronoid.	Surangular.
Splenial.	Splenial.
Dentary.	Dentary.

I have quoted Mr. Sutton's paper as fully as possible, because it is practically the most recent work on the subject and for reasons which I may explain later.

My own observations on the subject commenced several years ago. In cutting a section of the neck of a three months' fetus for examination of the developing larynx from above downward, the appearance of the developing jaw was such that it was evident that the last word had not been said on its ossification. Having made observations of one or two facts, namely, that Meckel's cartilage did ossify and that the so-called dentary center extended right up to the middle line (symphysis), I had to rest content, having no material available by which I might test the

accuracy of statements made with regard to other centers of ossification in the lower jaw. Latterly, however, I have come into possession of fresh material, for some of which I have to thank Dr. Keith of the London Hospital, for much other material, several old pupils, and for many valuable sections, made especially for this research, Prof. C. S. Minot of Harvard University, who has taken the greatest possible interest and trouble over the matter. Many of the figures illustrating this paper are from sections supplied by him, and I very gladly take this opportunity of acknowledging his great kindness and at the same time the usefulness of the Harvard embryologic collection, which apparently is at the disposal of any responsible worker.

In spite of the fact that I have come into possession of much

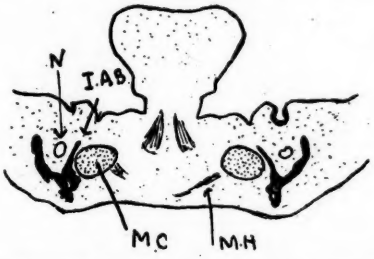


Fig. 13.—(Harvard collection. 819, O., 305.) Coronal section of 19 mm. embryo behind mental foramen to show inner alveolar border, I. A. B.; I. D. N., inferior dental nerve; M. C., Meckel's cartilage; M. H., mylo-hyoid musole; N., inferior dental nerve.

new material, I am bound to say that I am not in a position to state exactly at what time ossification really begins, but I have cut embryos of from 12 to 15 mm. in length which may be reckoned as five and one-half weeks, and have seen no bone; ossification, however, is well advanced in embryos of from 19 to 21 mm. in length, so one may say that it occurs perhaps in the 17 mm. embryos. That, however, is not very important. It is rather to state the nature of the ossification and the number of centers of ossification which arise that this research has been undertaken.

We have seen the variety in the various accounts given in the text-books, and it remains for me to show if these accounts are accurate. In order to test these statements, sections have been made in various planes of embryos ranging from 19 mm. in length to over 100 mm., all sections being serial.

As is well known, Meckel's cartilage forms a very prominent object during the early stage in the development and ossification of the jaw, and until bone actually appears is for all practical purposes the lower jaw itself. Soon, as we have already seen, it becomes covered by ossification in membrane on its outer side, and from that time forward its importance diminishes and it ultimately disappears, except proximally and distally; proximally forming at least the malleus, and distally becoming an integral part of the bony jaw, for the time being at all events.

As accounts given of Meckel's cartilage in man convey but little accurate information, and seeing that it is such an important element in the formation of the jaw, it may not be out of place

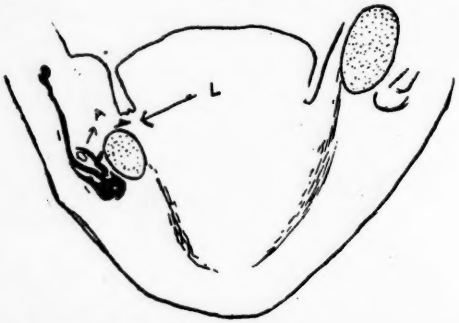


Fig. 14.—Showing formation of inferior dental canal at posterior end by a piece, A, growing outward from inner alveolar process. L. is the lingula.

to make some remarks concerning it. It is somewhat late in appearance, for, although one can make out its anlage in precartilaginous conditions in the 12 to 13 mm. embryo, it does not become cartilaginous until after the femur does. This is not what one would expect, seeing that it is such an archaic structure.

When formed, the two cartilages (when seen in horizontal sections) form a horseshoe incomplete in front, at first being separated by an appreciable interval; soon, however, they meet in the middle line, and later usually overlap one another there. Each cartilage is thickened in the vertical sense on each side of the future symphysis (see scheme of cartilage, Figs. 2 and 3. If we trace the cartilages backward from this anterior thickening, we find that they form a large bend, with the convexity outward,

and still further backward form another bend, the concavity outward, before ending in the malleus. The latter bend is found in front of the Eustachian tube. In its concavity lies the inferior dental nerve, and against its convexity the lingual nerve (Fig. 4).

Fate of Meckel's Cartilage.—The posterior or proximal end becomes converted into the cartilaginous malleus, the anterior or distal end from about the level of the mental nerve becomes incorporated in the jaw and undergoes ossification. The remainder disappears completely. It is generally stated that a part, that stretching between the lingula of the lower jaw and the malleus, becomes the internal lateral ligament of the jaw, but that, I think, is more than doubtful, as one can see the ligament quite well de-

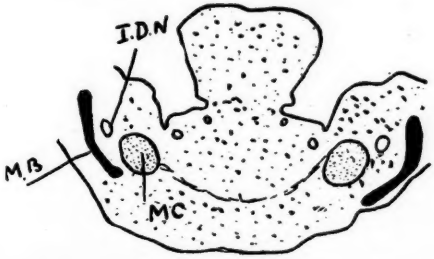


Fig. 15.—(Harvard collection, 819, N., 287.) Coronal section of 19 mm. embryo I. D. N., inferior dental nerve; M. C., Meckel's cartilage, M. B., membrane bone.

veloped at the same time that the cartilage is also well developed, the latter lying in a groove on the inner side of the former. In the transverse horizontal section of the head of a 42 mm. fetus, the two structures appear to be quite independent of one another. So much for Meckel's cartilage for the present; it may be referred to later.

We may now examine the appearance presented by the membrane bone, and that may be best done by examination of horizontal sections primarily, then of corneal ones corrected from time to time by sections cut sagittally.

These sections were cut by Professor Minot from an embryo measuring in length 21.8 mm. and were stained with alum cochineal and alum hemotoxylin—the latter only being effective. They yielded most interesting results.

In one section (Fig. 4) one can see Meckel's cartilage, M. C.

sweeping backward and outward; in its anterior concavity is the lingual nerve, L. N., and in the concavity of the outwardly directed posterior end of the cartilage is the inferior dental nerve, I. D. N. Behind the lingual nerve is the Eustachian tube. All these, but especially Meckel's cartilage and the inferior dental nerve and its terminal branches, are important landmarks. Figure 5 is cut a little higher up than Figure 4. It shows the anterior end of Meckel's cartilage, M. C., in front of which is membrane bone, to the outer side of which is a nerve—the mental, M. N. This is succeeded by another strip of membrane bone, M. B., giving an

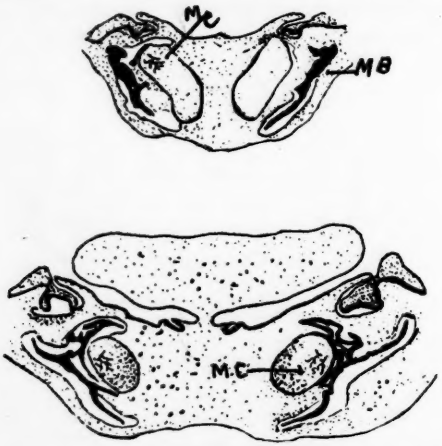


Fig. 16.—(a) Meckel's cartilage ossifying; M. B., membrane bone, (b) Shows upper and lower shelves, which ensheath Meckel's cartilage.

appearance as if there were here two centers of ossification. These two patches of bone are continuous below the mental nerve, as in Figure 4, and appear as one strip thicker near the middle line than elsewhere.

From what one can see in Figures 4 and 5 and in the scheme (Fig. 6), it appears that ossification has commenced in front of the anterior expanded end of Meckel's cartilage and the incisive branch of the inferior dental nerve, and has extended backward under the mental nerve, M. N., as a strip of bone rapidly diminishing in thickness, and consequently looking more faintly stained than that near the middle line. It is in close relation with the

antero-external aspect of the inferior dental nerve and its incisive branch. No trace of any bone is to be seen on the inner side of these nerves at this time. In other words, there is not at this time developed an internal alveolar border. This, however, very rapidly appears, and its method of appearance is of great importance, as it involves the question of the separate origin of that part of the bone. Some authors, whose observations have certainly not been based on serial sections, e. g., Spix, Cruveilhier, Renault and Rambaud and Sutton, describe a separate ossific center for the splenial, as Sutton calls it. We will be able to see, however, that this inner alveolar border does not commence in that way, but arises by ingrowth from the main mass just behind the mental

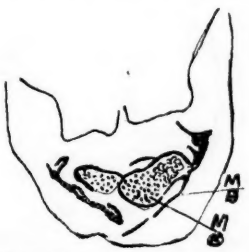


Fig. 17.—Coronal section at third month, showing ensheathing of Meckel's cartilage by membrane bone. M. C., Meckel's cartilage; M. B., membrane bone.

nerve in the form of an obliquely directed shelf, which comes to a point behind the "lingula." This shelf insinuates itself between the inferior dental nerve and Meckel's cartilage, coming to a point behind, as already said, and overhanging there Meckel's cartilage. At no time is it completely separate from the main mass, and it is, therefore, not an independent element—in other words, there is no splenial center.

At first, there is no inner alveolar border behind the incisive nerve, but there grows backward over Meckel's cartilage and under the incisive nerve near its origin from the inferior dental nerve, a shelf. In Figure 7 (my own collection), this shelf, A. B., can be seen growing backward over Meckel's cartilage, M. C., and under a tooth germ (lateral incisor). The inner alveolar border, then, arises from the main mass in two ingrowths, first, one under the inferior dental nerve, which enlarges in the backward direction and ends ultimately at the lingula, the other

growing under the outer end of the incisive branch of the inferior dental nerve and extending inward toward the middle line.

In Figure 8 (my own collection), a horizontal section of the head of a 42 mm. embryo, M. M., represents primitive membrane bone forming the outer alveolar border. M. N., is the mental nerve. I., is the cuspid tooth. A., is the posterior segment of the inner alveolar border much reticulated and, therefore, in an advanced state of ossification, whereas B., is the anterior segment of that border, existing only as a thin lamella and developing somewhat later. It will be to our advantage to examine a series of coronal sections of a 19 mm. embryo cut by Professor Minot

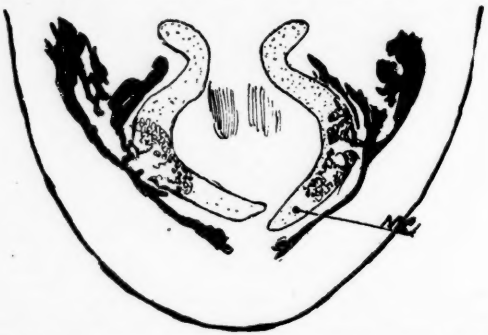


Fig. 18.—Horizontal section of jaw at third month, showing outward bend of Meckel's cartilage, M C., and that cartilage undergoing ossification.

and corrected by others of a later date cut by him and by myself. If such be examined from before backward, very instructive views are obtained both of the manner of growth of the formative bony center and its subsequent extensions.

In Figure 9, one can see on each side of the middle line a mass of membrane bone which lies in front of the anterior expanded end of Meckel's cartilage and extends to the middle line, not, as Sutton thinks, stopping short at the mental nerve. He says that all that part of the mandible anterior to the mental foramen is ossified from Meckel's cartilage. This section, and others, notably one of the third month, cut horizontally, show that the membrane bone reaches to the middle line (Figs. 9 and 8), and that Meckel's cartilage does not ossify as yet up to the middle line.

In Figure 10, we still have no inner alveolar border, the two

cartilages of Meckel are altering their shape. M. C., is Meckel's cartilage. M. B., is membrane bone outside it. M. N., the mental nerve, and I. N., the incisive branch of that nerve.

In Figure 11, which is just in front of the mental foramen, one sees Meckel's cartilage more widely separated and more circular in form; on the outer side of them one sees the membrane bone, M. B., jutting upward and outward between the mental and incisive nerves, M. N., and I. N. In the left half of the section one can see the incisive nerve being enclosed in a canal—the incisive canal, I. C. There is no inner alveolar border in this section. In Figure 12, the jaw is cut through at the mental foramen. The membrane bone here seems to be in two parts and one might think that there were two centers of ossification, but in the subsequent sections we will find that is not the case—M B., is mem-

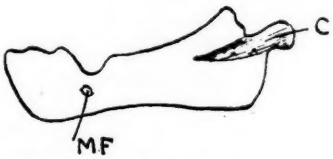


Fig. 19.—Scheme of left half of jaw, showing plug of cartilage, C., and mental foramen, M. F.

brane bone, M. N., the mental nerve, and I. N., the incisive nerve. The two nerves here mark the mental foramen.

In Figure 13, the jaw is cut behind the mental foramen and one now sees an alveolar border passing up between the inferior dental nerve, N., and Meckel's cartilage, M. C.; it is evidently a shelf and an outgrowth from the main mass. The inner alveolar border comes to a point behind, hence when cut coronally that point appears detached (Fig. 14, my own collection) and simulates a separate splenial.

Still further back (Fig. 15) the inner alveolar border has disappeared and the jaw is once more unilamellar, having to its inner side Meckel's cartilage, M. C., and the inferior dental nerve, I. D. N. Still further back one may see the condyle in a procartilaginous condition, but no drawing is given of this, the coronoid process is also evident, but quite thin, and it can be seen to be an ossification of that fibrous blastema which lies like a wedge between the masseter and temporal muscles at this early stage of

life; it is perhaps more in connection with the temporal muscle than the masseter that it is developed.

So far, then, we have seen a jaw consisting of Meckel's cartilage and a membranous bone, which stretches to the middle line in front, and behind the mental nerve gives off a shelf—the internal alveolar border. We have seen that the coronoid process, and for that matter, too, the angle, are thin, and that the condyle

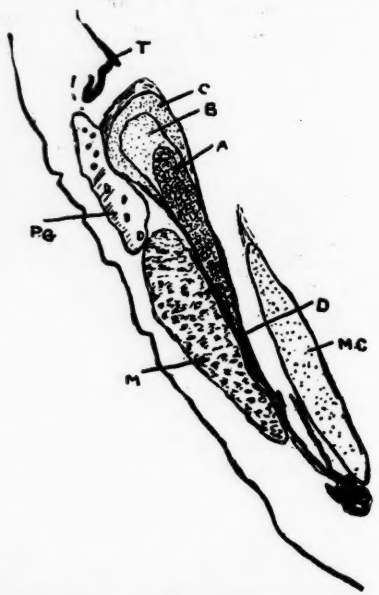


Fig. 20.—Horizontal section of three months head, through condyle and neck of jaw. D., ensheathing membrane bone; A., cartilage bone; P. G., parotid gland; M., masseter; M. C., Meckel's cartilage.

is not yet ossified. Very soon this membrane bone increases in amount, it has already done so in front and where ossification first took place, Figure 6; it now thickens and becomes reticulated in the region of the angle, the top of the coronoid process and in that part of the inner alveolar border which is developed behind the nerve. It is now that those false impressions may arise from the employment of crude methods such as that of Sutton, who, removing one-half of the jaw from a fetus, immersed it in alcohol

and cleared it with balsam and saw centers for "dentary," "condyle," and "coronoid," as well as a separate "splenial" center. Serial sections will show the falsity of conclusions drawn from the employment of such a method.

Further Changes in the Membrane Bone—The Formation of the Roof of the Inferior Dental Canal.—This commences to be formed quite early in fetal life, in the neighborhood, first, of the mental nerve, then of the incisive branch of the inferior dental, and, considerably later, during the third month of fetal life it appears near the lingula. In each case, save that of the roof of the mental canal, it appears in the form of a spicule running from the inner alveolar wall to the outer. In Figure 11, Harvard collection, the incisive nerve can be seen lying in a canal or tunnel formed by a spicule of bone arching over it from what will become inner alveolar border to that which is the outer alveolar border. In Figure 14 (my own collection) there can be seen at A a spicule of bone which is growing outward over the inferior dental nerve to the outer bony lamella, and so covering over the nerve in the neighborhood of the permanent inferior dental foramen.

The inferior dental foramen is not, by the way, as Sutton would have us believe, formed at the junction of the coronoid angular, dentary, condyloid and splenial centers, for these centers are, for the most part, imaginary, certainly in the case of the coronoid, angular and splenial, and the condyle is so peculiarly formed as to be out of the question here. Sutton, too, would have us believe that the mental foramen is formed at the junction of his mento-Meckelian center, developed from Meckel's cartilage with the membrane bone which he calls dentary. We have seen that there is no such mento-Meckelian center such as Sutton describes and that the mental foramen is originally a groove on the top of the membrane bone which grows from before backward underneath the mental nerve.

In support of his theory with reference to the splenial center, Sutton quotes the mylohyoid nerve and states that it is shut off from the inferior dental by fusion of the "splenial" with the dentary. As a matter of fact, the mylohyoid nerve has reached its place before the inner alveolar border has grown to any extent backward.

Further Changes in the Membrane Bone.—These changes, so far as we are concerned here, involve its relation to Meckel's cartilage. Sections cut either coronally or horizontally show that Meckel's cartilage becomes invested with a covering of membrane bone, partly by ossification taking place in its sheath, partly by projecting shelves growing from the inner alveolar border and the undivided membrane bone below that. Then, in Figure 16—a, b—(my own collection), Meckel's cartilage can be seen to lie in a bony groove whose upper wall is from the inner alveolar border and the lower one from the main mass.

In Figure 17, ossification can be seen in the sheath of Meckel's cartilage. By the meeting of the upper and lower shelves and the fusion of the ossified sheath of Meckel's cartilage, the cartilage becomes included in front of the mental nerve within the jaw; behind the nerve it lies in a groove formed by similar shelves, which, however, never meet.

The septa between the tooth sockets are developed comparatively late in fetal life, that one behind the cuspid tooth appearing before the others. It can be very well seen in a four months' fetus. During this time, changes have been taking place in Meckel's cartilage itself.

Ossification of Meckel's Cartilage.—About the tenth week of fetal life, ossification commences in Meckel's cartilage at a spot on its outer side corresponding with the site of the mental foramen, or even a little internal to this, and nearer the upper than the lower border of the cartilage. This ossification extends gradually inward, but does not completely involve the anterior end of Meckel's cartilage until the time of birth even, as evidenced by the presence of cartilaginous masses which are well known in this situation (Figures 16, 17, 18).

Appearance of Additional Cartilages in the Jaws.—These are described in various places in the jaw. I have not myself seen all that have been described, but that is no reason for believing that they do not exist, the only question being their constancy. One, at least, of these cartilaginous masses is constant and it is of peculiar form, existing in the form of a plug, which enlarges to form the condyle proximally and tapers away distally to a point, having traversed the neck and root of the coronoid process of the jaw. This is shown in Figure 19, C being this plug of cartilage.

It appears during the second and third months and very soon becomes calcified. It is enveloped everywhere except at the condyle by membrane bone and it becomes transformed into bone itself almost as soon as formed.

In Figure 20, (my own collection) one sees this cartilage undergoing ossification and being surrounded by a sheath of membrane bone; at the condyle, B, there is a part of cartilage as yet unossified and this is covered by a cap of fibrous tissue which, according to Hertwig, is permanent. This plug of cartilage has never any connection with Meckel's cartilage.

Recently, Doctor Low of Aberdeen, in an excellent demonstration of the jaw ossification, showed a patch of cartilage along the anterior border of the coronoid process, but I do not know whether or not that be constant. I, myself, have never met with it, but that may be because the material I have cut is too young. (Since this was written I have seen a specimen showing the cartilaginous strip along the anterior border of the coronoid process.) Other patches are said to occur at the angle and at the outer alveolar border in the neighborhood of the incisor and cuspid teeth (Kollman).

Conclusions.—Having now examined various sections of the jaw and those of different ages, one may draw the following conclusions:

First.—The jaw in its ossification is not so complex as some would have us think, but it is for all that complex, involving, (a) Meckel's cartilage at its anterior extremity; (b) the membrane on the outer side of Meckel's cartilage; (c) at least one accessory cartilage which is found in the condyle, neck and base of the coronoid process of the jaw. These statements apply to each half of the jaw.

Second.—In order of sequence, ossification occurs first in the membrane between the mental nerve and the middle line and extends backward under the mental nerve. Next, ossification commences in Meckel's cartilage about the tenth week of fetal life in the region of the mental foramen and gradually extends inward. That part of the jaw then between the mental foramen and the symphysis is compound in origin, being partly cartilaginous, partly membranous, not entirely cartilaginous, as Sutton says. Finally, ossification takes place in the accessory mass of cartilage in the condyle and root of the coronoid process at the third month.

Third.—There are no separate centers in membrane for either the coronoid process or for the angle or the so-called splenial, all these parts being outgrowths, as it were, from the main mass.

Fourth.—The inner alveolar border is developed in two parts by ingrowths from the main mass and at two different periods. That part behind the mental foramen appearing first and elongating from before backward, that part in front of the foramen appearing later and growing from behind forward.

Fifth.—The canal for the nerves is completed by the growth of spicules from one alveolar border to the other over the top of the nerves, the mental nerve being first so covered, then the incisive, and much later the inferior dental near the permanent inferior dental foramen.

Sixth.—The sockets of the teeth become bony comparatively late, that of the cuspid appearing first.

Seventh.—Meckel's cartilage becomes incorporated in the jaw anteriorly by the development of upper and lower shelves, which gradually close over it; behind the mental foramen these shelves do not meet, and Meckel's cartilage is consequently not included in the jaw, but gradually atrophies.

Eighth.—I do not think that Meckel's cartilage atrophies to form the internal lateral ligament of the jaw. This ligament at the fourth month can be seen quite distinctly in an ordinary dissection to be independent of Meckel's cartilage.

All the figures except 2, 6 and 7 are camera lucida drawings.

THE RELATION OF THE DENTIST TO THE PARENT, THE CHILD AND THE SPECIALIST.

BY A. C. RUNYAN, D.D.S., SOUTH HAVEN, MICH. READ BEFORE THE SOUTHWESTERN MICHIGAN DENTAL SOCIETY AT NILES, MICH., APRIL 10, 1906.

I fully appreciate the magnitude of my subject, and can only hope to touch some of the "high places" in passing over it. This is a paper I have had in mind a long time and had hoped to be able to present with illustrations and lantern slides, so that I could bring out my points and suggestions in a way that would better illustrate the conditions that I wish to bring before you. I

had in mind a sort of popular lecture that the laity, general practitioner, the different specialists, particularly the orthodontist and the nose and throat specialists, might appreciate our position and the service we might render to all if we were permitted to do so.

Unfortunately I had trouble in getting my slides made, and only two or three of them were transparent enough to make a clear picture on the screen, so I will have to postpone to some future meeting the plan I had in mind. However, I think the matter is of such importance that I will speak of a few of the most pertinent features, and at some future time we may have something more along the same line.

In our professional relations with a parent, I do not believe that a dentist has done his full duty when he has simply performed the operations that have been found necessary. If there are any irregularities caused by improper extraction the dentist should point them out and explain how they could have been avoided by proper care at the time. If the arch has been contracted by mouth breathing, show the results, and explain how proper care and a slight operation might have prevented the deformity, maintained the contour of the face, and without doubt given better general health. A dentist ought to be able, in this way, to awaken an interest, so that the parents will think of the welfare of their own children along these lines. Parents should be impressed with the advisability of taking their children to a competent dentist at least twice a year from the time the temporary teeth begin to erupt till they have their complete set of permanent ones.

At this point in my paper I intended to show by the lantern a few of the extreme cases of malocclusion caused by the premature extraction of the temporary molars, the loss of the first permanent molars, and by mouth-breathing, caused by adenoids or enlarged tonsils, with which conditions you are all familiar, but perhaps never try to explain to a parent when you recognize them. We now come to the child.

The true dentist is in a position to render better service to mankind, through the child, than any other professional man. If his talks to the parent have borne fruit, or if from any other reason the child is brought to him, he should not only do the immediate work at hand, but should make a comprehensive study of the case. He should see whether or not there is proper occlusion, and if not,

ascertain the reason why. The child may be a thumb-sucker, or may be a victim of one of those damnable rubber contrivances called a "baby comforter," and advice should be given regarding the ill-results of the practice.

There may be adenoid growth, or enlarged tonsils, which the dentist is in a position to discover sooner than any other person, and if he neglects to inform the parent of these conditions, and does not advise that a specialist be consulted, he has neglected to do his whole duty. The principal reason for advising a parent to take the child to a dentist at least twice a year to have the mouth examined is that any of these conditions may be detected. The true dentist may discover any of these conditions and timely advice may be given, and what years of suffering and chagrin may be avoided by a little advice at the proper time. Here should be given a series of illustrations showing conditions that may be easily and quickly remedied with a little care and attention.

Now, in regard to the specialist. The field of the dentist is more intimately related to that of the eye, ear, nose and throat specialist, and the orthopedist. While he should always be on the most friendly terms with all practitioners in the medical profession, he is in a position to render the nose and throat specialist the greatest service, and the nose and throat specialist can be of great service again to the specialist in orthodontia.

If the dentist does not see the case in which enlarged tonsils or adenoids have done their work of deformity, and the child has been sent to the throat specialist for treatment, that specialist does not do his whole duty unless he sends the child to the dentist to have the irregularities of the mouth corrected. Here a set of slides, showing the cases caused by mouth-breathing, thumb-sucking, premature extraction of the temporary teeth, also showing how diagnosis is facilitated by the X-ray and skiagraph, should be used to show what can be done in the way of regulating teeth.

I have taken all this time in telling you the kind of paper I should like to have had, and if what is written is worthy of discussion I will be very much pleased to hear the criticisms.

DISCUSSION. *Dr. Fred Bonine,* NILES, MICH. This paper that we have just listened to opens up so many lines of thought that it is difficult to start out in any particular one. The line that is suggested to me at first is the relation that should exist between

the dentist and the laryngologist in particular, because it should suggest one condition that is most often neglected, and that is, the relationship and friendly feeling and the intermixing and intermingling of the dentists and specialists. It has been tried and tried for years to bring together the specialists in the different lines for the very purpose of bringing about the result that would undoubtedly benefit the child in particular, because it is often the case that a child with enlarged tonsils or adenoids, or some condition, will be presented to the laryngologist, and, if the attention of the dentist also is called to the same condition, so much benefit accrues that oftentimes the bad results are averted. There isn't a day goes by, but what you will see, as the result of bad judgment and the failure of the concentrating of the opinions of the two specialists, children really suffering as the result. I would like to hear more on the subject of the relationship of the dentist and the laryngologist than on anything else because that is one of the things that to my idea is most neglected. You will see a body of dentists get together and hold a convention and a body of specialists get together and hold their convention, but this happens to be the first time in my experience that there has been as much of a mixture as this. But I am of the conviction that if more attention could be paid to this close relation of the specialists, more good would come to the patient, and the paper that the doctor has just read has caused that suggestion to come to me stronger than anything else that might be brought up.

Dr. Worboys, ALBION, MICH. I don't know that I have anything to add to this paper or to the discussion save to make it stronger by hammering a little along the same line. From the dentist's standpoint I assure you that in my experience I have seen many cases in which the patient would be greatly benefited if he had the services of a physician and dentist along about the same time, the two working in harmony. I have one case in mind particularly in which a girl about 12 years of age had enlarged tonsils, was a mouth breather, had a very irregular set of teeth, the front ones bulging forward, such a case as we are all familiar with. I got no results in attempting to regulate those teeth. I couldn't do a thing with them until after she had been to see a physician and had the air passages properly cleaned out so that nose-breathing could be established. Then I had the benefit of the muscles of the

lips to help me, and after things were corrected, I had these muscles all working to hold things in place. The patient got all the benefit and I got the money, which of course is what we all need, but the great thing is to render all possible service to our patients, and give them something that is going to be lasting. And working together so, we can do very much more than any one of us can do alone. The case quoted is only one of many in which we did work together to advantage. There are many others from which we cannot get away. It is a human body that we are all working on, some of us on one part and some on another, but we are all working with a common purpose.

Dr. Land, DETROIT, MICH. I would like to ask the doctor who read the paper just what causes mouth-breathing, how the damaging effect takes place, and what is the germ, if there is a germ, that has a tendency to produce this condition? Also about the injury affecting the muscles, brought about by breathing through the mouth?

Dr. Worboys. I will have to turn that over to Dr. Bonine. We know what the results are, and the questions are out of my line. Those who are true dentists should be in a position to recognize the condition and turn the patient over to someone who does understand. We know what results are caused by adenoids and enlarged tonsils. As to a germ, I am not in a position to answer. Probably Dr. Bonine can answer.

Dr. Land. I have been grinding on teeth now for twenty years with dry wheels and in doing so have noted very interesting results, that is, in regard to the dust that falls from the wheels. It has revealed to me the vast difference between the number of hairs we find in the nostrils of mouth-breathers and those who breathe through the nose, also the difference in effects. These hairs act as a filter that takes the germs from the air inspired. I have found almost invariably that those troubled with colds are mouth-breathers. Those who have a large number of hairs in the nostrils and breathe through the nose very seldom have throat trouble or any diseases of that nature. It is remarkable—this difference between noses and the quantity of hair that acts as a filter, and it may come from hereditary conditions, or it may come from local conditions. I am not in that line, however, and from my

observations, think many of these things are brought about by a multiplicity of germs.

Dr. Thompson, DETROIT, MICH. This is an open question and there remains a great deal to be found out in regard to this trouble, but I would like to ask Dr. Land how many children's noses he has examined and in how many cases he has found any remarkable growth of hair at such an age. The damage arising from mouth-breathing is done before there is much hair in the nose. I have had severe colds from dry dust and dry wheels. I know that is quick business, but whether it has any bearing on the discussion at the present time, I have my doubts. I think in most all cases of mouth-breathing there is some hereditary taint or a following of the reproduction process, that is, following the type of the parent with the deformity. I think it is brought about that way more than in any other. I know one family very well and the whole family seem to be misfits. There is not one really healthy child in the family of four children. The make up of the mother and the make up of the father are of such a nature that there is no assimilating the two parts and approaching anything near like harmonious development. Every one of the children are mouth-breathers, their noses are large enough, but at the same time the inner part is lacking in room. All have enlarged tonsils and one or two of them have adenoids that they should have removed now, and I believe we must go back still farther than anything we have control of at the present time, to remove these things. I feel sorry for the patient that has to go to the dentist and then to the oculist, and then to the physician. One such said to me the other day, "I have been to So-and-So and to So-and-So, and now here, and I don't like it." I said, "Just think of the money you have put into circulation—."

At the present time I am associated with two doctors in Detroit, a throat man and one other. Both fine men in their respective fields and the operating process seems to be the only one they know about to correct such a deformity. Such cases might be corrected by enlarging the nasal cavities by some mechanical means.

I have a case in mind now that I sent to Dr. ——, and at the suggestion of Dr. —— the young lady was sent to Dr. —— and I said, if the doctor does what he says he can and there is any

chance of his doing it, I should advise it by all means. We are watching results carefully; the case is remarkable, and the young lady has been very patient, but she does not give any glowing accounts of the result at the present time. In a couple of years from now we may notice benefits derived from the work.

Dr. Bonine. If this St. Joseph River down here were deviated in its course, of course it would make a new channel for itself, and the same would hold true of these adenoids and tonsils that deform the air passage. Now, I believe thoroughly in the science that goes a little farther back than the patients themselves. It is a fact that you can extend the jaw, you can extend the nasal passages, you can remove the adenoids or the tonsils, but after all that has been done and the process of extension has been stopped, more or less recession will take place, and gradually one will find himself at the starting point. By doing these operations one can assist in establishing nasal breathing, but at the same time one comes a very long way from establishing normal conditions. So far as the morphological theory is concerned, it is being developed gradually, slowly and thoroughly, and if we can remedy conditions by arrangements or a set of filters that will keep germs from the nose and from the throat, we will have obtained perfection. As to the growth of hair in the nose, nature has done that to assist us, but after all, the efforts we make are very puny as compared with the healthy body. I think mouth-breathing once established is a thoroughly deep-seated function.

Dr. Land: I would call your attention to one case, that I can verify, that of my wife. She had a tendency to irritation of the throat from sweeping carpets, and I never knew it to fail that if she swept a carpet she had a cold and a very distressing cough, although she can breathe most of the time through her nose, but whenever she breathes through the mouth, or sweeps a carpet, she has a cold, and therefore I got rid of all carpets and substituted hardwood floors. In addition to that I filter all air that goes into the office, and have for years, and ever since she has been very well. These are things I can verify, and we have never known it to fail that if she swept a carpet she would have a cold.

Dr. Thompson: Some time ago in the *Ladies' Home Journal* there was, in a series of articles in which he described some prominent men, a history of Henry Ward Beecher, written by the editor

himself. In this history the editor tells of his asking some question and then being taken into a room, where two boxes of old letters were brought out and looked over by the editor and Mr. Beecher, and from the very day the latter opened that old box of letters and began looking them over, he contracted a cold that resulted in his death. According to this article, and I believe it right along the lines that Dr. Land speaks about, we have more data than in any other line. In your town, or in Detroit, or any other town, I believe it is a crime for the city fathers to allow the street cars to run on perfectly dry tracks at this time of the year. As far as is possible I get inside and avoid the dust from back platforms, and on a day when it is wet I stay outside. I believe that more colds result from open cars and outside platforms than from any other source.

Dr. Rowley, NILES, MICH. I would say just one word in regard to what Dr. Bonine has to say. He is a physician and is mistaken, as nearly all physicians are, in regard to some things that dentists do. The good doctor says we can enlarge the nasal passages and the throat and extend the arch, and in the course of time the original conditions will prevail. I wish to inform Dr. Bonine that when the dentist extends the arch and keeps it extended a sufficient length of time it never goes back, but remains there for life. What good the doctor may do in correcting the nasal passage and throat passage I could not say, but in regard to the mouth he is simply mistaken.

Dr. A. C. Runyan. That little point that I failed to bring out, was the necessity of working in harmony. It does no good to remove these adenoids and tonsils unless the arch is extended. That is the reason why the dentist and the other specialists should work in harmony. It does no good to regulate the teeth and extend the arch unless the adenoids are removed, because one causes the other, it is just a matter of cause and effect, and unless we work together we get no special results. This is the principal reason why it is necessary to advise the patient, and when the child comes into your hands, to advise the parent regarding the child. The dentist is in a position to see conditions. He can see many times that a child has adenoids and enlarged tonsils. If these are not removed at the proper time he will get no good results.

WHY THE SO-CALLED GOLD ANNEALER SHOULD BE USED IN GIVING THE HEAT TREATMENT TO GOLD FOIL.

BY M. L. WARD, D.D.S., ANN ARBOR, MICH. READ BEFORE THE SOUTHWESTERN MICHIGAN DENTAL SOCIETY, AT NILES, MICH., APRIL 10, 1906.

It is with reluctance that, in the midst of this porcelain epidemic, I attempt to present anything which will stimulate a lively interest in this subject which in the minds of a great many is being too rapidly consigned to obscurity.

It is getting more and more obvious every day that altogether too many operators who have served their patients well for years are failing to realize the intoxicating effect of "something new," and are being led astray by the porcelain enthusiasts who often cast aspersions and caustic remarks at the men who are delinquent in taking their porcelain in the usual large doses that are now being administered.

It is true that some of the most artistic work can be done with porcelain, but who is there among us who would enumerate the requisites for a good filling material and place color above durability, when the operation is located in a remote part of the mouth? But the specialists say, "the convenience to both operator and patient in inserting the filling is a greater blessing than any thing that was ever given to the profession before," and continue the tirade against some of our most conservative men, though they are undoubtedly the best ones, by terming them "partial converts."

It is certainly incomprehensible that so many men claiming to be leaders in this progressive period of dentistry can be (to put it mildly) so inconsistent as to visit some of the most energetic and conscientious men in the profession, and at the sight of a gold annealer remark that it no longer had a place in the office, that the user was not converted, that if he believed in porcelain at all he believed in it altogether, and that if porcelain was good for one place it was good for every place in the mouth.

I must affirm in the most positive manner that those who indulge in such remarks have not the remotest claim to the position they assume to occupy, nor are they accomplishing the good that they

might, by making a firm believer of every man in the profession that porcelain should be inserted in a most artistic manner in all sightly places, and only in such remote places as were not exposed to the forces of mastication.

I, for one, feel that I owe an everlasting debt of gratitude to some of these men for the impetus they have given the subject, though I am confident that the near future will prove that porcelain, like all other filling materials, has its limitations, and that these same enthusiasts will be forced to admit that the field for porcelain fillings is not limited by the *skill* but by the *judgment* of the operator.

Is the gold annealer to be a thing of the past, as the "porcelain enthusiasts say." or is its field of usefulness to be lessened by the judicious distribution of porcelain and gold inlays?

Has porcelain come to substitute any of our filling materials completely, or has it come to be added to our present number, thus furnishing us one with which we can imitate nature more closely? These are the questions which confront us now and are being decided in favor of the latter by many men who are worthy to be classed with the broadest in the profession.

One might as well try to convince Dr. Honey that the gold inlay was not preferable to the porcelain in many locations or to teach Dr. Hims that standard alloy is not preferable to the high percentage silver alloys in some cases, as to try to teach to good, sound men the total extinction of the gold annealer and gold foil as a filling material.

While the amount of gold foil used for fillings has been materially lessened by the introduction of porcelain and gold inlays, it is by no means substituted by either of them and must be considered one of our permanent filling materials for some time to come, at least. With the rapid advancement that has been made in dentistry within the last few years has come a device which has not claimed the attention that is due it as an effective means for preparing gold foil for filling.

This device, "the so-called gold annealer," a very misleading name, enables one to heat the gold sufficiently to effectively drive off most gases from its surface without the possibility of contaminating the gold. It is quite generally understood now that all gold foil for filling teeth is and should be as pure as it can be

made, though it is claimed by many that its cohesiveness is not interfered with, when slightly alloyed with certain metals.

It is also well known that there is no difference between cohesive and non-cohesive gold, as it comes from the manufacturers, except that the non-cohesive has ammonia condensed on its surface, while the cohesive has none.

They were both *purified, beaten* and *annealed* in the same manner but just previous to marketing, a part of the lot is passed through ammonia fumes and marked non-cohesive simply because these fumes form an imperceptible film which, while not affecting the purity of the gold itself, prevents intimate contact of the different layers of gold. From this we may see that a pellet of cohesive gold may be made non-cohesive by exposing it to the influence of ammonia gas and this pellet thus rendered non-cohesive may in turn be made cohesive by driving off the gas with heat. This latter process is what we actually accomplish in our every day operations with non-cohesive foil when we heat it and it is in no way intended to anneal the gold.

The "so-called annealing" of gold foil is not analogous to, nor in any way connected with, the annealing of plate gold which has become hard by hammering and often has to be raised to a red heat to relieve itself of the state of strain. Much of the difficulty experienced by operators in the insertion of gold is undoubtedly due to faulty methods of giving it the heat treatment, and even among operators who are sufficiently skilled to obtain good results by the ordinary methods, there is much to be gained by adopting some of the more recent advantages that are afforded us in the use of the "so-called electric gold annealer." A great majority of operators are in the habit of heating their gold by passing it through the flame of a spirit lamp, or a Bunsen burner, but in either instance we are never certain of always having pure flame, besides there is not one in a dozen that understands that he is removing gases and not developing cohesion, an inherent quality of the gold itself. To remove these gases uniformly and completely a comparatively low heat and more time is required and is best accomplished with an "electric annealer." It has been shown by experiment that the cohesive property of ordinary gold foil as it comes from the manufacturers shows itself at about 250 degrees F. and increases from this point to about 375 degrees F.,

after which nothing is gained. As this heat is not visible many dentists who have not tried the gold annealer with its low heat believe that the gold annealed in this way is not thoroughly annealed, but clinical use of it shows it to be most cohesive.

It must not be understood that this amount of heat would be sufficient if the gold is held in the pliers where a large amount of heat is conducted away nor would it be sufficient if the gold were subjected to it for a short time only. It is, however, sufficient if the gold has not been too tightly rolled and the ends of the pellets crimped by cutting with the shears so that the gases cannot escape readily. I do not mean to infer that these gases cannot be driven off quite uniformly by passing the gold through the flame of a spirit lamp or a Bunsen burner, nor that for the general work of filling teeth it has not been done very well for years, but who is there among us who cannot recall some nice operation that he has done that later on developed a pit on its surface due to failure of some piece of gold to weld? Who is there that can doubt but that gold rolled by machinery with the ends of the pellets wide open, as they are furnished us now, when placed upon an electric annealer will develop a high and more perfect cohesion than any gold that was ever rolled by hand and heated by holding it with the pliers in the different flames which are so often vitiating and contaminating? The presence of moisture in the air always affects the alcohol flame because of the great affinity which alcohol has for water. An undue humidity in the operating room often results in a vitiated flame which shows itself with a yellowish tinge. The flame from a Bunsen burner is more reliable than the alcohol flame, but it, too, will give a variety of results depending upon the location of the gold in the flame and the purity of the gas.

The lower part of such flames consist of gases, while the upper part is largely products of combustion, and when at their best it is very doubtful if gold coming in contact with them is not in danger of contamination. Granted that the flame used was in perfect condition, the other methods of procedure necessary to carry out this manner of annealing are certain to give unequal results. A pellet of gold that is picked up in the pliers and passed through the flame is quite certain to have from one-fourth to one-half of it between the plier points imperfectly annealed,

even though the end of the pellet most remote from the pliers is heated to its melting point, and besides a portion of the pellet has been compressed so lightly that gases, no matter how easily driven off, would be mechanically held in the pellet, thus preventing a welding of the different layers. Some operators claim to obviate this difficulty by rolling the gold into a rope and then heat the entire rope on a sheet of mica.

This eliminates the danger of contaminating the gold with the gases and products of combustion, but is usually accomplished in so short a time that the gases cannot escape from a rope of gold unless the rope has been made very loose and the temperature has been unnecessarily high.

Should the operator succeed in removing the gases quite completely there is another objection; while it may appear a trivial one to some, it is to be considered in this connection, viz., the impact of the scissors in cutting pellets from a rope of annealed gold compresses the ends so much that they are not obedient to the plugger point nor readily adapted to difficult angles and margins.

Another operator claims to change ends with every pellet of gold, thus getting both ends of the pellet well heated, but even then he has not overcome the objection of compressing the pellet so that the condensed gases are mechanically held in the pellet.

Another operator claims to hold his gold in the flame with a plugger point and in this way avoid compressing the ends of the pellet and at the same time has a minimum amount of heat conducted away. While this method is better than the pliers, unless the plugger point is heated sufficiently to ruin its quality as a plugger, the gold is never perfectly annealed in the region of the point, besides there is great danger that the products of repeated oxidation of the plugger point will be incorporated in the filling only to be disclosed upon some conspicuous surface after some little attrition on the filling.

From what has been said it would seem that even the most casual observer would be convinced that, while beautiful gold fillings are being done without the electric annealer, it possesses fewer disadvantages than any other device that has been brought to our attention, and that gold that has been heated on it has a working quality that cannot be obtained in any other way.

The time saved by using the annealer instead of holding the gold in the flame is not a minor consideration, since all operations with gold foil consume a comparatively large amount of time. Even with operators who are rapid workmen it will be found to save them upward of 25 per cent of the time ordinarily required to insert such fillings. Those who are not located where the electric current is at their command will find the annealers that are made for gas and alcohol flames preferable to the naked flame, though if they are not *carefully managed* they will not give much more uniform results than the flame itself, because of the uneven distribution of the flame over the annealing tray. In conclusion, I will say that I firmly believe that those who once become accustomed to the soft, though highly cohesive, property of gold rolled by machinery and heated on an electric annealer, will have no desire whatever to return to the older methods.

I also believe that the average operator, even though he sacrifices something on density and tensile strength, will, with this method, secure an adaptation that will raise the percentage of his successes.

DISCUSSION. *W. E. Harper,* CHICAGO. From numerous standpoints, as were brought out in the paper, the minimum of time is required, and the better quality of the filling obtained in the use of the electrical or some equivalent annealer. We rarely see fillings of six, eight and ten years' standing, without finding on their surfaces some pits or some indentations most often caused by faulty annealing. I have used the stand and tray with the alcohol lamp for my purpose and possibly I accomplished what appears to be equivalent results both in the minimum of time and the conditions of service after years of wear. I don't imply that I am above making a mistake, or even finding a filling of mine with a pit, but the general average of work is much better with the electrical annealer than with any other means I have used. I did for some years use alcohol flame for lack of any better.

Now as to the difference between the cohesive and non-cohesive gold. You can find on the market non-cohesive gold that cannot be made cohesive by any amount of annealing. In that case it is rendered non-cohesive by some other agent than ammonia gas. In non-cohesive, I fancy some salt is used which makes it non-cohesive by any kind of heat. The gold that cannot be made

cohesive, non-cohesive gold that cannot be made cohesive, is covered with something that cannot be driven off with heat. That leads me to the point that you cannot anneal gold with safety by carrying it through the flame with a pair of pliers unless you consume a large amount of time in so doing. It would be necessary, to properly anneal a piece of gold, to take hold of it twice, to put it down on the table and take it up again by the other end, otherwise you will certainly have a piece of gold in which you have highly developed cohesion in one part and imperfect cohesion in another part, which will result in an imperfect filling. Now, in the ordinary distal or mesial filling, one that doesn't involve an angle, such a filling as that, if the pellet is used, I would probably use what is called one-half, the number of the pellet, that is, its size is indicated by ½. In a simple mesial cavity I would use at least fifty pieces of gold. I know the quantity in the various size fillings made, I know the spaces on my tray, my tray contains about 47 spaces in which gold is placed before beginning, and the amount of refilling indicates the number of pieces. Now just imagine the time that is lost, to say nothing of the quality of the annealing. If you spend five or ten seconds in the annealing process through the flame, which would be necessary to accomplish the purpose, it will easily amount to 25 per cent of the time required to do the operation complete with the electrical annealer. With the annealer you get a perfectly cohesive piece of gold, if it can possibly be made so by the application of heat. This minimum of time and quality of filling is something that ought to appeal, I am sure, to every operator.

I am going to let the other fellow do the porcelain work. I hold the porcelain work in very high esteem. It requires experience, it requires skill, that few of us possess, and it requires a man to do a great deal of that work to do it well. I draw my conclusions from the work it has been my privilege to examine. I feel that the dentist who is doing the porcelain work instead of the gold work is not very apt to do it well unless he is getting a much better price for his porcelain than for the gold, and the complaint of the dentists is that they can't get the prices for gold. I don't believe that a man can do porcelain work unless he can get an approximate price, and I am still of the conviction that we can put in gold fillings in many instances much cheaper,

much better, than the porcelain, so that I am one of the few that are still sticking to gold and I think with proper conditions and the proper annealing, it can be depended upon at all times, and especially is that true if the disposition to decay remains as it does in most instances during some period even of adult life.

I do not know that I have another thing to add to what others have said, except to plead for the use of the electrical annealer, for your own sake, for the sake of the patient and for the quality of the work done.

Dr. Lanphear, PAW PAW, MICH. That is one of Dr. Johnson's ideas, I can see. Dr. Johnson fully realizes that I am a small fellow in a small town, though I have been urging the porcelain business in a little way. The idea is here. From what I see of it in our town (this may be taking me a little off the subject), I think the trouble with the porcelain for the man in the small town is that he cannot get the right amount of work to do and cannot get the right price, so he has to depend on getting back to the gold filling, and the annealer question with me is, too, a rather hard one, because we haven't the facilities to use the electrical annealer. I find a good many other practitioners near by who are compelled to use the alcohol flame. The question of the alcohol flame is not a very pleasant one with most of us. I think if we could have the ideal conditions, we would all go over to the electrical annealer.

Dr. Sprague, DECATUR, MICH. I have a suggestion to offer regarding annealing. In offices in which the alcohol flame is to be used, if gold is kept in ammonia fumes, and thus kept from contamination with other gases (an ammonia salt is formed, and that ammonia salt is the most volatile of all common salts), the gold is more easily annealed. The salts or gases that are on the so-called non-cohesive golds are not as easily driven off.

Dr. Worboys, ALBION, MICH. This electrical gold annealer is a nice thing. I recommend that all get them. I haven't bought one yet. This subject of annealing gold is a pretty hard one. It is older than I am in the business and I have seen some fillings that have stood up and stood mastication, that were made with cohesive gold before anything better than an alcohol flame or Bunsen flame was used. They have stood the test, though some have pits. I don't believe one of these pits is due to non-cohesive

gold. If anything caused it, it was the operator's failure to beat that gold down where it belonged. I believe that cohesive gold can be thoroughly malleted, and if it is not thoroughly malleted one will have pits. So much depends on the operator doing his work well. You can get an electrical annealer and an alcohol flame annealer, or gas flame annealer, but you want a *clean* flame. I presume that the annealer that will anneal sufficient gold for most small fillings at once is an advantage for time. It is a time saver. It is a good thing for the dentist and a good thing for the patient, but I don't want any patient to go away with the idea that the annealer does the whole business. If you get an annealer you will have to put the gold in place and plug the tooth and make a water-tight filling. When you make a porcelain filling you have to make a water-tight cork. You have to be a corker.

Dr. Hadley, COLDWATER, MICH. I would like to say a word to substantiate the last speaker. A man in my office had six gold fillings put in twenty years ago. I want to say they have been in twenty years and there is not a pit in one of them. They are as smooth as when they were put in and there are no signs of decay. They were put in by a young fellow in Coldwater.

Dr. Runyan, SOUTH HAVEN, MICH. I haven't an annealer, and as my fillings have a good many pits in them, I think it is because of this fact.

Dr. Land, DETROIT. I almost abandoned the inlay eighteen years ago, although I invented it. I abandoned it not because I thought it would not save the teeth, but because it showed a partial disfiguration of the joint that was visible, so that the majority of patients would come back in six or eight months and ask me to remove the inlay because of the dirty joint. I have inlays that are in good order, with the exception of the joint. The enamel is not the weak point. We should remember that every gold or porcelain crown and every bit of bridge work probably have worse joints than the inlay, but in the former they are out of sight and do no particular harm. To think that we must abandon gold is a mistake. A man cannot abandon amalgam, he cannot abandon guttapercha, he cannot abandon gold. All of these things are useful, and will always have a place. So far as the alcohol flame is concerned, there is nothing about it that injures gold. It is only a question of how one anneals and what for. There is no gas

that escapes that would be injurious to gold. The gas stays on the surface. As for myself, I would use an electrical annealer because it is a nice thing. I can use gold and make it last as well as any one. It is all a question of locality and of what is best for the patient. As for porcelain, it is strictly the esthetic. Outside of that there are plenty of fillings equivalent to it. It remains for the specialist to carry out porcelain in the large cities. In the smaller towns one can use porcelain work only in a limited degree.

Dr. Ward, closing discussion. Any gas, I don't care what it is (nor do I care into what the gold is placed), will be condensed on the surface, and is injurious. I don't mean to infer at all that good gold fillings haven't been put in before the electrical annealer was known. But there are advantages in the use of the electrical annealer, the saving of time being the principal one, and next the quality of the gold is much improved, but you all know that a good filling does not need to be made of gold annealed by electricity.

A FEW THOUGHTS ON THE TEMPORARY TEETH.

BY MARTIN DEWEY, D.D.S., KANSAS CITY, MO. READ BEFORE THE SOUTHWESTERN MICHIGAN DENTAL SOCIETY, APRIL 10, 1906.

In writing this article I do not make any claim for original thought. I only want to impress upon the general practitioner of dentistry a few things which are apparent to us as orthodontists, things which he is prone to overlook in his everyday practice.

I will first speak of the use of the temporary teeth, which is twofold, as has been shown by Dr. Angle. The first purpose of the temporary teeth is to perform mastication during the early life of the individual. It was for this reason, no doubt, that the temporary teeth were formed. We also find that they have another use, that is, to cause the normal growth and development of the jaws. As is so well known, no organ will properly grow and develop unless it has the proper use, and the jaws can only grow through the use of the teeth.

I want to impress upon you the necessity of retaining the temporary teeth the full length of time intended by Nature. They are worthy of your best efforts. The loss of any temporary tooth before the proper time will almost invariably produce some mal-

occlusion of the permanent teeth. This is especially true in reference to the temporary molars.

A large number of temporary teeth are sacrificed annually because the dentists do not have the patience to devote the necessary time to them, but justify their acts by saying that the permanent teeth will soon erupt. The permanent teeth no doubt will erupt, in most cases, but very often there will not be the proper room for them. The temporary tooth having been taken out too soon, the jaw has failed to develop. The result is a malocclusion which the dentist often tries to explain by the old theory of heredity or something equally as absurd. There may be a few cases in which the extraction of the temporary teeth do not cause any malocclusion, but they are extremely rare. The loss of the anterior temporary teeth will cause bunching of the anterior permanent teeth. The loss of the temporary molars will not only cause a malocclusion of the molar region in the arch from which the tooth was extracted, but will also in most cases cause an abnormal mesio-distal relation of the arches. An abnormal mesio-distal relation of the arches can also be caused by the improper treatment of the temporary teeth. The temporary molars are wider mesio-distally than the bicuspids. If the temporary molars of one arch should decay and be so filled as not to maintain the full mesio-distal diameter, it would allow the permanent molar to assume a position mesial to normal at that age. This will result in an abnormal mesio-distal relation of the arches which generally becomes permanent.

By a careful study of the temporary teeth, very often conditions can be found, which, if allowed to remain, would result in extreme malocclusions of the permanent teeth. The successful practitioner to-day is he who sees these conditions and advises that they be treated before they have reached their limit. Dr. Talbot has shown that if the temporary teeth have been retained their full length of time, before nature casts them off, there will be a spacing between the anterior teeth. If this occurs you are safe in saying that there will be no great malocclusion of the anterior permanent teeth. When this spacing takes place it is a sign that the jaws are developing as they should.

Malocclusions of the temporary teeth are very rare, other than those caused by premature extraction of teeth. We find a few cases which are the result of thumb-sucking and lip-biting. Also,

some that are the result of nasal obstructions. Others than these we seldom see. Dr. Anema has said that "probably the greatest reason why there is such uniformity of harmony in the facial lines of children is that their teeth (the temporary teeth) are practically free from malocclusions." If this normal occlusion of the temporary teeth is maintained there will be fewer cases of deformed faces as a result of malocclusions of the permanent set. The good you will do your patients will repay you for the extra effort you have to put forth.

I have tried to show you the importance of maintaining unbroken the temporary arch the full length of time intended by Nature. Also, the influence they have in causing a normal occlusion of the permanent teeth. I hope I have succeeded to a certain extent.

To Wax Together the Fragments of a Broken Plate.—It is often difficult to securely wax together a broken plate, especially a lower partial. The attempt to hold the broken pieces in one hand, while you attach them with the other, makes you wish you had three or four hands. If a strip of wax, such as the dental depots use for mounting a set of artificial teeth, be softened and laid on a flat, unyielding surface, a piece of glass, for instance, the broken plate may be pressed teeth down into the wax, using both hands to hold the pieces in proper position. When you let go, they will remain in place and you are free to examine carefully, and wax together.—A. C. Willman, *Dental Review.*

Deep Injections of Alcohol in Neuralgia.—Ostwalt states that he has made 250 deep injections of alcohol in cases of tic douloureux or facial neuralgia, and never has had the slightest mishap or unpleasant by-effect. The pain was arrested at once. The effect is like a transient Gasserectomy, as for the time being the functions of the Gasserian ganglion are suspended. In at least 90 per cent of the cases the neuralgia was cured by the procedure. In about a third of the patients recurrence was observed after four or five months, but one or two more injections definitely banished the pain. He injects 1 or 1.5 c.c. of 80 per cent alcohol, to which .01 gm. of cocain or stovain has been added, making the injection along the trunk of each of the branches affected at the point where they emerge from the bone. He prefers a bayonet-shaped needle and has found these deep injections of alcohol effectual in case of neuralgia elsewhere in the body, in sciatica, etc. He has also cured cases of rebellious facial hemispasm by injecting, a drop at a time, 70 per cent alcohol along the trunk of the facial nerve, according to Schlösser's technic.—*Jnl. Amer. Med. Assoc.*

Digests.

THE NEED FOR A WIDE OUTLOOK IN DENTISTRY. By Douglas Gabell, M.R.C.S., L.R.C.P., L.D.S., New Barnet, England. When I received the invitation to read a paper before this society I was rather dismayed at the additional call thus made upon me! I thought I had well-nigh exhausted my capabilities in keeping pace with the wants of my own society, but the pathetic tone of your appeal, and the doubts it expressed on the existence of a public spirit among dentists, made me feel distressed, for I could not but recall the good work so quietly done by many for the weal of the profession. Their good example urged me to emulate them, so I racked my brain for a subject on which to speak to you. Your letter of invitation, with its statement that fellowship among dentists was at so low an ebb, convinced me that you could not have looked very far around in a profession that has so rapidly raised itself to such an honorable position. It is foolish to suppose that any body of men could have done so by each looking after his small self and never getting beyond that. Nor do I believe that the good men are all dead; in fact, I know better; there are many men, both young and old, to-day making willing sacrifices for the good of their profession. And so it occurred to me that by inviting you to take a wide view of dental matters, I might add to your happiness.

Now every dentist ought to look after himself. "Self-preservation," we are told, "is the first law of Nature;" so that we may describe the man who devotes his whole time to such an object as being in a very primitive state, very much alive, very practical, very keen, independent and self-assertive, a hard worker, and armed at all points. From a small point of view very perfect. Much as a self-reliant, ownerless mongrel might be considered more perfect than a fox-hound or sheep-dog.

But it has been found by experience, and nature continually works along this line, that "Union is strength." That the efficiency of organized groups is greater than the sum of the efficiency of the separate units, and that the formation of societies is the most perfect method by which people may take care of themselves.

The mere banding together of capable men will not make a good, efficient society. More than that is required. Each unit must be good, but each unit must also willingly support and help each other unit, there must be the new virtues of patriotism, friendship and unselfishness; even with these the society will fail if there is not also good organization, requiring the power of leadership and obedience. And the leaders must have a clear view of the present and future needs of the society, and make wise provision for them.

Let us see how nature works; the healthy human body is composed of many cells, each cell is a good cell, but they are not all alike, they are not all good all-round cells, but each has a particular property developed highly, the other properties being reduced, never lost. Each cell carries on its own business, and also, and in such a highly organized community as the body to a great extent, labors for the common weal; for which, in return, it receives much more than it gives. This unselfish labor is only rendered possible by the perfect organization, whereby each cell is sure of receiving proper provision for its personal wants, which provision is brought about by the implicit obedience of all the cells to the nerve impulse and the proper appreciation of the cell wants by the brain.

Even more, as the body has to provide for continuing the race, so dentistry has to provide for the upbringing of future dentists, the education must not be directed exclusively to the making of mere self-sufficient units, but to the making of units that will also work together for the welfare of the profession; for nothing is more sure than that a compact body of men, helping each other, will soon find themselves far better off than any isolated individuals, even the lame ducks of the society will be in advance of cleverer isolated men. The professions of medicine, surgery and dentistry made very poor progress whilst each practitioner kept his knowledge a secret to himself; but when the magnificent principle of hiding nothing, patenting nothing, but adding all knowledge to the common stock came in, at once progress became rapid, for everyone received far more than he gave.

And so, gentlemen, you to-day receive freely the discoveries of past and present generations of dentists, you benefit by the political wisdom and self-sacrificing labors of many men, many of whom

are to you, I fear, almost unknown; but because you do not know them are they less patriotic, is there less fellowhip on their part? Come you out into the struggle, learn the history of your profession, give allegiance to your leaders, add your mite freely to the common stock, and you shall not lack for fellowship.

There should be a healthy rivalry between Dental Societies, each striving to be the best, but societies are only units in the profession, and must obey the same laws, must not only be efficient themselves, but must help each other, and the best society is the one that does the most for the common cause. And here, gentlemen, I know that we are in agreement, for it is in response to your invitation to the Students' Society of the Royal Dental Hospital of London that I am here to-night, as their representative, to offer you our hearty fellowship and what small help I can. In spite of steam and electricity the barriers of space have not yet been swept away, and we cannot often meet personally, but the name of the Students' Society of the Victoria Dental Hospital of Manchester will always insure a hearty welcome to any of you who will give us the pleasure of a return call.

I suppose that a profession grown to the size that dentistry has cannot expect to escape from having parasites—men who, though not a part of us, attach themselves to us and suck out all the good they can, and give nothing in return to their host. In fact, they are not only robbers, but an eyesore and a disgrace, and disobedient to all moral laws. We have the right, of course, to pluck off all such and to protect ourselves and the public from their ravages. Legal prosecutions are one way of attempting to do this. But the obtaining of Acts of Parliament prohibiting unqualified practice will not cure the evil. The Ten Commandments have been law for some thousands of years now, and yet stealing, slandering and covetousness are not stamped out.

It must be remembered, also, that as a protected profession we have a duty to the public: to do the work that we have undertaken, to furnish dental assistance to those who need it; and if we do not fill the bill we must not be surprised if the public allow others to step in and partake of the profits, and I think that it rests with us to prove that we alone are able to do the work fully and well before we can expect to obtain further legal protection, such as the prohibition of practice by the unregistered. It is a

sound principle for the state to foster and protect efficient workers, but not inferior stop-gaps.

The uneducated dentist does little to save teeth, he ruthlessly destroys them to insert imperfect substitutes. An inferiorly qualified man would do little better. Whilst on the other hand the best educated men will prevent more disease and save most teeth.

I would remind you that the Dental Act was not obtained till after hospitals had been built, and dentists were becoming better educated.

But how about the dentist who has to compete with the quack? Certainly he is hard pressed at times, he has to spend time and money on education, whilst the other man uses his capital to advertise himself. It may be a hard fight, a long fight, and certainly is an unequal fight, for it is not possible for ignorance and lies to beat knowledge and truth. It is higher efficiency and morality that is wanted in order to win, not an inferior, cheaper article.

And here I would point out to you another effect of lowering, or not raising, the standard of our registrable qualifications. There are in America many men anxious to practice in this country, but the difficulty of getting the L.D.S. is a great deterrent, and it is the breadth of that course that is the chief difficulty. The new schedule of general subjects has cleared the way for them a great deal, and already the influx of D.D.S. men to take the L.D.S., has started a competitor much more to be feared.

And will you here excuse me for quoting from a recent address of Sir Frederick Treves on the bases of success, especially as regards the medical profession?

"In enumerating these factors," he said, "one was early met with the assurance that such success depended largely upon money, upon influence and social position, upon good fortune, and, above all, upon the possession of genius. He did not believe in any of these. The following might claim, he thought, a more substantial position as factors which made for distinction in a professional career. Briefly enumerated, they were health, serviceable knowledge, sympathy and honesty; industry was presupposed."

The point I wish to make is that just as a much better way of overcoming evil has been taught us since the time of the Ten Commandments, namely, the overcoming of evil with good, so the best and surest way to oust the quack and charlatan is to

provide a much better, more efficient, and honester dentist. The law remains to teach and help, but can never cure the evil.

It is true to-day as ever, that—

Though the mills of God grind slowly, yet they grind exceeding small;
Though he stands and waits with patience, with exactness grinds He all.

Turning now to the actual practice of our profession, we have to spend a great portion of our time attending to holes in the teeth, often small holes, and always small teeth; it is necessary for us to pay great attention to minutiæ, to be very gentle, careful, precise; but we must beware lest we become so engrossed on these minutiæ that greater matters escape us.

Let me give you a few examples of what I mean: A man may become a good operator, and yet fail to become a good dentist by engrossing himself in his operations and forgetting his patient. Picture to yourself the mental state on the one hand of a nervous and sensitive patient, on whom the dentist operates in grim, silent, relentless thoroughness, and on the other hand of the very busy, practical, healthy man, to whom the dentist administers much verbal comfort and encouragement and a temporary dressing. Do not forget the operation, do not let your ideal fall short of a perfect result, but be careful of your means to that end. Note all the conditions, the patient's personality is one. And courtesy, sympathy, honesty, cleanliness of person and surroundings, sociability, etc., may all be required to successfully do a small operation.

Again, do not at once focus all your attention on the tooth of which the patient complains, but take a deliberate and careful look all round the mouth; thus will you be spared the ignominy of attending to the wrong tooth, or of advising crowning when a plate would be far better, or when the bite renders either useless. Such an examination is necessary to enable you to advise the patient as to what is the best line of treatment, and how much requires to be done. And it will save you from disappointing your patients and incurring much well-merited blame.

Do not be content to patch any flaws the patient may complain of, but try to find the reason of the disease and put a stop to that, so that the repairs you do may be permanent. Search wide for all evil influences. Also as regards the cause of pain, it is

well not to be too limited, as is proved by the story of the young dentist who noticed the very evident discomfort of his patient, though he felt sure that his operating could not really be more than uncomfortable, certainly not enough to justify the antics of the patient, till at last the sufferer exclaimed; "I don't mind your tinkering with that tooth, but for heaven's sake take your coat button out of my eye." Further, I might say, as an example of what you should not do, when taking an impression of the mouth for a denture, see that the moustache is not also included.

Consider your patient before you start on an operation, lest, haply, like the man who commenced to build a tower, you find yourself unable to finish. There are people who cannot endure a long gold-filling, people who faint when hurt or frightened, people who bleed profusely or do not heal well.

The extraction of a tooth: "How easy!" says the young dentist. "How pregnant with dangers," says the experienced one; and I cannot believe this to be the timorousness of old age. An examination paper at the college recently contained the following question: What effect may the loss of a tooth have upon its neighbors, antagonists, and upon the mouth generally? I believe there are not many who could answer that question well, and yet it should be the duty of all dentists to know exactly every effect which might accrue from this everyday operation.

Then there is the mechanical side of our profession; and many, nay most, pupils think that the whole art lies in the perfect plaster impression, the well-trimmed model, the accurate bite, the perfect fit of the plate. But all these are but some of the necessary means to an end—that most difficult part, the part of which the books never speak—the making the patient wear the perfect-fitting plate. Then is wanted the seeing eye, the artistic sense of appropriateness, the faculty of knowing when and where to give strength or delicacy; the patience to encourage and help a clumsy patient to use the plate; the ability to detect the cause of pain or tilting, and remedy it; to learn the patient's method of biting and allow for such movements. "Mechanical" dentistry, indeed! was ever an art less mechanical?

There is also the limit of the amount of money and time a patient can afford to spend, and though you will always uphold the reputation of your position as a member of a generous pro-

fession, and will certainly never do bad or skimped work, yet there are ways of giving a patient a sound, healthy and serviceable dental armature with amalgam fillings, extractions, and vulcanite or dental alloy plates, where gold bridges and inlays are prohibited. And the good dentist should, where much time and high fees are impossible, study how he can do the very best under these more difficult circumstances.

When instructing patients on the care of their own and their children's teeth, do not pin your whole faith to the use of a tooth-brush and some favorite powder. Such, I venture to say, is a small feature in the care of teeth. Think also of the necessity for proper feeding of infants and adults, the need for the full exercise of the jaws and tongue, the method of breathing, the general surroundings. Thorough mastication, I hold, is a better mouth-cleaner than any brush. Again, different conditions of the mouth demand different methods of cleaning; no one method will suit all cases. And do not be too dogmatic as to unessential details, try to make your methods fit in nicely with family customs, some taught by the family physician, for, alas! our authority with the public is small, and will never be great until we can show a wider knowledge.

Also, there are more important things than getting out a bad tooth, a child's faith in human nature is one. No one can wish to stand in the position of the dentist who told a small client the operation would not hurt and then removed a tooth. The little patient bore the pain bravely, and only said, "Aye, but that was a lie."

Let us look now to another, and to you very personal, aspect of dentistry—dental education.

There are to-day, as our history shows there has always been, two predominant ideas: both lay stress on the necessity for manual dexterity, but beyond this they diverge widely.

There is the idea that dentists need only to know those things which are directly concerned with their operations, and that knowledge beyond this is useless to the majority.

And those who hold this idea would direct education almost entirely into only those channels which lead to the perfect carrying out of such operations, and to the acquiring of only such knowledge as is recognized to be directly concerned with these opera-

tions. So that the dentist concentrating all his energies on the routine work of his life, by the exclusion of all other matters, shall be the more skilful worker.

The other idea is that dentistry is a part of medicine: a science and an art, requiring, in addition to manual dexterity and local knowledge, a knowledge of the workings of the human body, each patient presenting some pathological condition to be treated or prevented.

And those who hold this larger and more comprehensive idea would direct education to the acquirement of a wide range of knowledge—knowledge that will illuminate facts around about those directly concerned with practice—that shall throw light back on the causes of things, around on the true relationships of things, and forward to the improvement of methods of practice. They will also include professional ethics and political economy in their instruction.

Now it must be obvious that either of these ideas may be pushed to excess, and it is upon the correct adjustment of them that the highest success depends. Huxley thus defined the ideal of a liberal education: "That man, I think, has had a liberal education who has been so trained in youth that his body is the ready servant of his will, and does with ease and pleasure all the work that, as a mechanism, it is capable of; whose intellect is a clear, cold, logic engine, with all its parts of equal strength, and in smooth working order . . . . one who, no stunted ascetic, is full of life and fire, but whose passions are trained to come to heel by a vigorous will, the servant of a tender conscience; who has learned to love all beauty, whether of Nature or of Art, to hate all vileness and to respect others as himself." That is surely an ideal toward which we might all agree to strive.

May I touch on a few points in dental education?

The technicalities of dental operations are few, and can be learned in a comparatively short time, and they appropriately form the first study of a student when he enters a dental hospital.

But skill in performing these operations can only be gained in the necessarily limited period of a hospital course if the hand and eye have been well educated in youth.

Graceful and free movements should be encouraged in infancy. Boys at school should learn to use carpenter's and iron-worker's

tools and to construct simple articles neatly. But the apprenticeship is the special time for gaining that dexterity which is so essential for the proper performance of dental operations, and whilst acquiring a thorough knowledge of the details of dental mechanics, the pupil should spare no pains to perfect himself in manual dexterity.

Still further that good judgment which is essential to enable the operator to select the appropriate method of treatment for each case can only be won when the student has gained a knowledge of the causes and the nature of the diseases to be cured, the properties of the materials he has to work with, and of the hundred-and-one difficulties that have to be overcome. In fact, not until he has had experience.

The two years' hospital practice provide very valuable and absolutely necessary experience, but many more years will be required before the student can be said to have that sound judgment which only falls to the ripe experience of educated men.

And when is knowledge to be obtained? Firstly in childhood. The child must be taught to observe facts, to see things, or he will never possibly remember. Next he must learn to read, so that the words in a book represent to him facts in Nature. How many men have the habit of reading books without realizing the words, and therefore complain of having bad memories. How few seem to picture the facts indicated by books, how many try to learn the mere words, even to problems in Euclid!

Then must come a general education, such as shall give him ability to use his brain well, and acquaint him with the rudiments of mathematics, grammar, science, art, and languages, and as much special knowledge of facts as he may be able to acquire.

This is the broadest foundation, and should be laid at school.

Next comes the study of the subjects specially useful to dentists, such as chemistry, physiology and comparative anatomy, mechanics, etc. And it is foolish to try to pick out the portions of these sciences that are more prominently of use to dentists and to learn only those; it is impossible to understand such isolated particles. The right way is to whole-heartedly study the complete science, to learn the laws that govern it, and the relations of its parts, and then to more specially study the parts which we know are directly useful to us.

And through all your life you will be acquiring skill and experience, yet only while you are young and free from responsibilities and the need to earn money will you have the opportunity to acquire knowledge of these sciences; yet more, as they themselves are the foundation of the sciences of general and dental surgery, they must be learned early and learned well.

Whilst at the hospital you have many opportunities that will never be repeated, of learning the nature and structure of the tissues on which you have to operate and of which you are expected to prevent disease; and to learn the nature of these diseases, and of their remedies. Then is the golden opportunity, then the time for most strenuous work and endeavor to get a comprehensive grasp of your subject and of its laws and principles, which you will find to be those of the greater science of medicine of which dentistry forms only a part.

And when you have finished your hospital course, do not rest contented with that magnificent foundation which your L.D.S. course assures to you. It is the best, most liberal, and most complete preparation for practice that the world has yet heard of, but it has never pretended to be all that a dentist should desire.

Let each licentiate proudly say he has had the best five years' professional, and a worthy preliminary, education, and let him then continue this education on the same well-tested, well-balanced, and prudent lines.

Do you think I am putting too much stress on the need of acquiring knowledge now that you have the chance? And knowledge a little wide of purely dental science? Think, then, of what we owe to such "outside" knowledge, to bacteriology, to pharmacy, to chemistry, and physics. Remember what a tremendous effect on practice the first has made in a few years, and consider what vast possibilities yet remain. Remember that the prevention of disease is our highest aim, and think of the many outside influences that affect the health of the mouth. There are many greater advances in practice yet to be made, and even if you do not aspire to initiate such advances, see to it that you shall know how to appreciate and utilize them when they come, or you will quickly be left behind in the struggle for existence.

As regards our standing in the community I think dentists

often take a narrow view. We are neither a separate profession from, nor a mere appendage of, the profession of medicine.

Dentistry does not consist entirely of the operations of cleaning, filling, extracting, or replacing teeth as patients may request of us, or even, as may appear to us, best from a purely local knowledge. It is to be regarded as that part of medicine which undertakes the care of the teeth, and the prevention and cure of their diseases by whatsoever proceedings may be best. Surely this is the right view; and it carries with it a necessity of a knowledge of general medicine, surgery, and physiology.

What dignity belongs to the man who daily performs a number of skilful routine operations on teeth without the knowledge or care whether he is doing the best for his patient, compared with the man who first considers, and from his comprehensive knowledge can correctly judge, what is best for the patient, and does that?

Because decay of the teeth is very common and painful, and therefore dentistry is able to provide work and money for a large number of men, it has come about that dentists are apt to think themselves a big profession. But is there any real foundation for counting ourselves as different from specialists on the eye, nose, or throat, except on the one point of having more work to do? Is dentistry more difficult, does it require more skill? Nay, is it not a fact that we are content to have a lower standard of general medical knowledge, for fear of prolonging the educational period and an insufficient number of workers entering the field? The dentist's knowledge of such fundamental sciences as physiology and pathology are woefully below the standard of other specialists.

We are more skilled operators than general practitioners, who mostly send their patients to specialists for big operations, though with the spread of Cottage Hospitals I doubt how long this will be true, and you must decide for yourself how much this compensates for our inferior knowledge.

I hold that the dignity of our profession, and our right to call ourselves a profession, and members of the great healing art, equally worthy with the physician and surgeon, lies in the fact that we shall take a like responsibility with them, educate ourselves to be able to judge correctly of all the diseases of teeth

and treat them as correctly as other practitioners treat the conditions they attend; and that we shall do it on the same high ethical lines.

We are worthy members of the medical profession: an actual necessary part, and no mere tolerated appendage; but we must of course remember that teeth are not so important as many other parts of the body, and we shall not therefore be counted as important as those who treat the more important parts.

Even the medical profession is only a small part of the community, and dentists are only a part of it. And yet some talk of our great profession and are discontented with the amount of attention our leaders have been able to obtain for us from Parliament.

Lastly, gentlemen, it has been taught to Christian men that each is a member of one great body, and must not repine because he finds himself only a humble member, further he is taught the uselessness of saying that he is altogether something else than such a member as he is; it will not make him any other; and then follows the practical instruction, each is bid to do his particular duty for the benefit of the whole body, and to do it in the highest possible way: in faith, in hope, and, greatest of all, in charity.—*British Journal Dental Science.*

SOME OBSERVATIONS UPON THE OBSCURE ETIOLOGY OF PYORRHEA ALVEOLARIS. By Herbert L. Wheeler, D.D.S., New York. In observing the various phases of pathological conditions exhibited in the disease which results in the destruction of the supporting alveolar wall of bone about the teeth in the human jaw, it has occurred to the writer that while local treatment is almost always beneficial and often curative, it is not invariably so.

This may be because the underlying causes are not primarily local, but are results of conditions the beginning of which extends back to the dawn of human existence.

From the various forms, such as local irritation caused by a deposit of calculi in a few places up to that condition of calcareous material which occurs well up under the free margin of the gingiva and causes a general irritation, there is produced a variety of pathological conditions. These are the congestion of the soft

parts and the disintegration and destruction of the underlying bone, producing waste material that invites the presence and multiplication of pus bacilli, or those disagreeable, infectious, and infected pus pockets known as pyorrhea alveolaris, which are followed by the loosening of the teeth and recession of the gums.

It seems possible that these various steps of disease and destruction may have their origin assigned to the time when primitive man began to experience the vicissitudes of an ever-changing environment. This mutation has finally grown to the conditions of our present high form of civilization.

With this thought as an incentive, I was induced for purposes of comparison to undertake the examination of the jaws and teeth of the large number of prehistoric American and other skulls to be found in the American Museum of Natural History, New York City, and also some in Peabody Museum at Harvard College.

Thus far I have examined carefully more than fifteen hundred skulls, and find conditions that are a surprise to me. I cannot do better than to give you a record as I took it down at the time of examination.

The first lot comprised some ninety-two skulls known as Jaliscos and Huicholes, Mexico; of this number only eleven showed any signs of alveolar destruction such as occur in the cases of pyorrhea alveolaris, and the destruction in most or all the cases was due primarily to an alveolar abscess which had apparently been caused by a diseased pulp. As to accumulation of calculi I shall speak later.

The next lot, from the Cave Valley mines, Chihuahua, Mexico, comprised some fifty-six skulls, of which the alveolus of six had been destroyed, this process in each instance being caused, as in the cases before mentioned, by alveolar abscess.

The next lot were more numerous and comprised Chihuahua, Tarahumar, the Valley of Mexico, the Michoacan, Tarascon and Otomie—altogether some two hundred and seventy-two skulls; of these forty-seven had well-defined marks of alveolar destruction around certain teeth, and in all instances the evidence indicated that they were caused by alveolar abscess.

These are about all the Mexican skulls examined. When I describe them as prehistoric, this means in the sense that they are

the remains of a people who inhabited the region from which they came previous to the coming of Europeans. How long they antedate this period is not known.

The next lot were of Peruvians, and were secured and brought to the museum by Professor Bandolier. There were seven hundred and twenty-one of these. One hundred and sixty-six gave evidence of alveolar destruction.

There were many curious abnormalities in these jaws, and conditions which might indicate a more advanced civilization than in the case of the Mexicans, but the general cause of alveolar destruction in these as well as in the others seemed to be abscess conditions.

In the territory now comprised in the United States the most ancient skulls were possibly those from Santa Catalina, southern California. Of these there were fifty-six. Fourteen showed evidence of alveolar destruction, the cause apparently being the same, viz., alveolar abscess. These skulls I found in the Peabody Museum of Harvard University.

Of great age also are the skulls of the Cliff-dwellers of southeastern Utah. There were seventy-two of these, and only four showed any evidence whatever of destruction of the alveolar process, these also being caused by a destroyed pulp and abscess following.

There were a few scattered ones from South America; five Amazonas from Peru, three of which were affected, and four from Patagonia and Tierra del Fuego, one of these four being affected.

From the northwestern portion of the United States and British Columbia there were a large number—one hundred and sixty-two, of which fifty-nine showed destruction of the alveolar process, and these cases were largely due to alveolar abscess; but in some cases syphilitic lesions seem to have been the cause.

From the southwestern portion of the United States there were skulls of the Pueblos of New Mexico, of which I examined twenty-one, only three of which showed any destruction of the process.

From White River, Arizona, there were the skulls of some Apaches, Anatobes, etc., eight in number, two of which showed destruction of the alveolar process. From the general appearance I think that both these and the skulls from the northwest are of

a later date than the Mexican, Peruvian, Santa Catalina, and southeastern Utah skulls.

From Siberia there were sixty-six Eskimo skulls examined, and twenty of these showed destruction of the alveolar process.

There were fifty-seven unclassified skulls, twenty-five of which showed the process more or less affected. Whether these latter skulls were modern or ancient I do not know.

Now, the thing that surprised me most was to find calcic deposit about the necks of the teeth in a large majority of cases, but rarely had it produced much effect except to cause a slight receding of the alveolar border and a slight thickening of the bone.

With the exception of a very few cases in these fifteen hundred skulls the destruction of the process in any such way as the disease of pyorrhea is known to destroy it was plainly due to alveolar abscess caused by pulp trouble, and this was to be found almost universally in those of advanced years and came about in this manner: The teeth gradually became worn down owing to the harshness of and the grit in the meal and cereals used by these people, this food material being probably ground by the primitive method between stones; and finally, after the wear had become so great that for some reason the pulp was no longer able to protect itself from irritation and infection, it succumbed to the inevitable, decomposed and caused an abscess which usually resulted in a greater or less destruction of the alveolar plate in the vicinity of the disease.

It was remarkable, though, how the tendency of the pulp, in these people of long ago, was to protect itself; the common condition is to find whole sets of teeth with the pulp-cavity well defined because of the deposition of secondary dentin.

If you will notice, the proportion of those that suffer from destruction of alveolar tissue is greater as the remains represent more modern times.

Pyorrhea alveolaris is such a misleading term that I hesitate to use it, as it implies a pus condition which is by no means always present during the destructive process; and interstitial gingivitis is quite as misleading, as it implies an inflammation of the gingiva between the teeth, which is not always present.

Some of the most obstinate and incurable cases that I have ever treated did not have pus in quantities large enough to dis-

cover it, and instead of there being an inflammation the condition was anemic, even the gingival margins being almost white; but the teeth were loose and the supporting process was undergoing rapid disintegration.

As the term pyorrhea alveolaris is the one most generally understood, I shall use that term, and by it designate those conditions in which the destruction of the alveolar process is taking place, either in isolated places or over the whole surface, regardless of whether there are pus conditions or not.

It is apparent to one who has observed this condition carefully that what occurs in the progress of the disease is not primarily a receding of the gums, as is universally inferred from the language used in describing this condition, but the destruction in some way of the underlying alveolar plate of bone, and the settling down of the soft tissues, as their support is withdrawn through the loss of the bone underneath, causes the apparent recession.

Now, just what takes place in this destructive process I do not know, and I know of no one who has satisfactorily described it. It seems to me, though, that there are underlying reasons why this disease is becoming more and more common, and my observations upon the skulls I have described have suggested to me some things that I have not found mentioned by other writers.

It is now generally conceded that the progress of the human race from the simpler to the more complex form of living is marked by progressive modifications and differentiations, so that as the changed conditions or environments occur, certain organs may become less and less used and others may be used to an exaggerated degree. Now, the organs not used are gradually suppressed or atrophied, while those that are becoming more useful are developed in an increased degree. This is due to inheritance and the propagation of those peculiarities that contribute most to continued life in the struggle for existence.

The human race is just as subservient to these laws of evolution as any other animal, and the environment of man and conditions under which he exists have changed more rapidly than those of any other animal, owing to his having arrived at a state where he has succeeded in recording his experiences and transmitting information for the benefit of generations to come.

This has resulted in a desire on his part to give more time to

the development of the mental and less to the acquisition of aids to merely physical existence. This means decreased physical energy in some ways and parts, especially in the matter of mastication, while increased knowledge has been used to help in the preliminary preparation of food for purposes of nourishment. Thus it is the kitchen and its equipments have softened the fibrous and tough meat used by primitive man and rendered more pulpy the starchy cereals, and nature, ever trying to adjust herself to circumstances, refrains from producing the energy originally necessary to accomplish by mastication what is now done mechanically and chemically.

This, I apprehend, is the reason why the calcareous matter deposited upon the teeth of ancient man was less destructive than at present. The food of those times was hard, tough, and fibrous, and required time and energy to prepare it for swallowing. Now, through the assistance of the culinary department and of proprietary and special forms of manufacture—as is evidenced by the great variety of breakfast foods—there is not material taken into the mouth to continue the stimulating and toning effect that the mechanical friction of fibrous and hard foods produced, and the tissues have lost their tone; and thus, those conditions under which the alveolar process was developed not continuing to obtain, the process of elimination is gradually asserting itself. This, then, is the condition we have to combat, but do not imagine an abrupt return to remote conditions would necessarily remedy the difficulty. Much modification has taken place since the cook-stove was originally used, and we should find an immediate return to early conditions as disastrous as the present apparent developing of a condition in which teeth will no longer be needed.

Of course there are details in the progress of this disease which are to be considered. The unnecessary extraction of teeth may bring an extra strain upon tissues already weakened by comparative disuse, and so cause a predisposition to the trouble. People may—in addition to their inability to supply fibrous matter in order that there may be friction in the masticating process—neglect to make some small amends by the judicious use of the tooth-brush on both teeth and gums. Bacilli may contribute to the trouble, but as microorganisms have existed from the beginning, and as the price of the continued existence of a species is adapta-

tion to its surroundings, I believe that under ordinary circumstances bacilli are harmless and are incapable of gaining a foothold until the vitality of a part by abuse or lack of use is so lowered that the ordinary resisting powers do not obtain. This does not apply to calcified tissues, and it seems to me that the highly accelerated rate of change in our environment, prohibiting nature from adjusting herself to the new conditions, is very largely responsible for the large increase in the troubles known as gouty and rheumatic, which are largely due to faulty metabolism.

This does not necessarily mean that the trouble is entirely local and caused by lack of the severe conditions under which these tissues were developed, for an inability to properly utilize and assimilate food in the stomach and intestines may also bring about conditions that contribute to the early destruction of an organ that is in the process of being rendered useless by lack of use, so that while the final destruction of the alveolar process may be a thing that threatens us, a faulty condition of nourishment may greatly accelerate this undesirable climax. Under the circumstances it would seem that if the conditions in the mouth could be kept similar to those conditions under which the hard and soft tissues have developed in the formative process, the ravages of not only pyorrhea but caries of the teeth would be greatly retarded.—*Dental Cosmos.*

MOUTH-BREATHING DUE TO NASAL OBSTRUCTIONS. By D. W. Flint, D.D.S., Pittsburg, Pa. A few weeks ago there appeared in our newspapers the results of a test of the eyes of the children in one of our public schools, by Dr. Kirk, and he found that 20 per cent of those examined needed glasses. Then I thought, what a blessing to humanity it would be if someone could give just one illustrated lecture to those teachers, who are so near to our children, so that they could inform the parents of the children who are suffering from closed nares, whatever the cause might be; for anyone who is but a moderate observer can detect a child suffering from mouth-breathing. And yet how many dentists, either through lack of knowledge or carelessness, fail to have their patients sent to a rhinologist for treatment. I have in mind now a young girl whose parents had not been sufficiently urged to have her adenoids removed. Had the mother been

shown the dangers associated with such a condition, I am sure something would have been done as a preventive. How much this girl would have been benefited had she only had her adenoids removed at 8, the models at 12 years of age I will show on the screen later; then you will see how the muscles through tension have pinched the upper arch until you can scarcely get your finger up into the vault. Also notice the force of the inclined planes of the upper cusps, how it has made the lowers all tip lingually.

From works on rhinology, I find that Meyer of Copenhagen, in 1868, was the first man to write on these growths; and it is only a little over 20 years ago that any of the evil effects on the teeth were shown. There are two varieties—the first consists of spongy stalactic projections from the vault of the pharynx; the second consists of smooth, fibrous tumors of irregular shape. They are highly vascular, full of lymph cells and a follicular structure like that of the oral tonsils.

The effects of these growths are so far-reaching that we are learning more and more each day as to the evils, not only to the teeth in destroying occlusion and the facial lines, but in their relation to the eyes, ears and thorax. In one of the works I read, one relates that in 426 cases of adenoids he found six deaf-mutes. He cured one and relieved another, both as to speech and hearing, by removing the growths. From another writer we learn that, in the statistics gathered from fifty institutions of the deaf, dumb, blind, feeble-minded, and insane asylums, 60 per cent of the inmates have some deformity or irregularity of the upper jaw, and that *all* have one or more of the conditions which cause mouth-breathing. This means simply that the existence of any condition of degeneracy resulting in blindness, deafness, mutism, or idiocy, the very reason for this degeneracy exists in the weakened, defective tissues in some place, which in the nose develops into adenoids, producing abnormal breathing in turn. It was not over three weeks ago that a lady asked me if one of the little girls for whom I was correcting her malocclusion was an idiot. She simply had adenoids and enlarged tonsils; and yet a person unacquainted with the disease could tell at a glance one of the symptoms. Nerve specialists tell us that the V-shaped arch tends to increase or develop a mental defect by limiting the cranial capacity; in other words, as the

vault becomes constricted, the pressure on the vomer becomes so great that the cranial bones contiguous with it are pushed higher up in the cranial vault, thus constricting its contents. Cases of varying mental derangement have thus resulted even so bad as to cause incurable insanity. You will see here that the straight septum would be more damaging than a deflected one.

Etiology. This is a disease of childhood, and cases have been reported where nursing children have had to have them removed. Dr. Sluder of St. Louis, in lecturing on adenoids, stated that he had done so in numerous cases. I will show you slides of the youngest case of corrected malocclusion after the adenoids have been removed. The work was done in four weeks, by Dr. Mendell, one of our lady orthodontia specialists. The boy will never know what it is to have a receding chin, and all the other attendant evils, because the first permanent molars will erupt mesio-distally normal.

Oftentimes several children in the same family are subject to these growths; they are always to be looked for in children with hypertrophic rhinitis, enlarged faucial tonsils, and high-arched or cleft palates.

Beginning with babyhood, they are active until the 15th or 16th year, when they atrophy. Between the ages of 5 and 8 they are the most apt to begin.

These cases are characterized by—

1. Parted lips, due to dropping of lower jaw.
2. A short and ineffective upper lip, which fails in any way to offer resistance to the incisors which are being pushed out by lateral muscular pressure.
3. A lengthening of both upper and lower incisors, but more especially the latter, due perhaps to a loss of function.
4. Prominent eyeballs (at times).
5. Obliteration of the normal lines of expression of the face (apathetic), and a consequent appearance of listlessness and inferiority.
6. Sub-development of the lower arch.
7. There is a thickness of speech and nasal intonation. As Chaucer said, "He intones in his nose."
8. These children are dull and absent-minded, and have the appearance of being inattentive, which may be due to their mental dullness or impaired hearing, or both.

9. They have one cold after another in the head.

10. Receding chin.

11. A thickened lower lip owing to its being pushed up into the space between the upper and lower incisors—and, perhaps, the extra function of moistening the lips.

12. Owing to lack of nutriment, the whole superior maxillary bones are smaller than they should be.

13. Contracted upper arch, due to pressure when the bones are quite pliable; the constant pressure day and night must of necessity produce such a condition.

14. Last, but not least, *protruding upper incisors*—for this is about the first condition that we see every hour of the day when walking in a crowd.

15. In general the nose, mouth and chin are out of balance.

The causes of mouth-breathing are several. "Adenoids, enlarged tonsils and hypertrophy all obstruct the nose in the same way, making mouth-breathers. A child is born with a strumous or syphilitic diathesis, or is idiotic; certain tissues as a result develop excessively. The tonsils enlarge and adenoids or hypertrophy of the nose develops, because the very tissue, being of inferior quality, takes the place of normal tissue and makes the child one of lessened vitality and inherent weakness. The nares as a result become occluded.

"A deflected septum usually begins in children due to falls and hard bumps on the nose when they are learning to walk. The cartilage, due to accident, bends either to one side or the other, and thus assumes this unnatural position. When thus changed the natural support to the arch is somewhat lessened, and if the patient be in a climate and be subject to conditions such as would produce hypertrophies we can easily see how the vault of the hard palate would be the more easily pushed up owing to the force of the buccinator muscles owing to the lessened resistance."—*Kohler.*

Treatment.—In the treatment, the first, and by all means the most important, is the surgical removal of the *cause,* namely, these growths. Whenever we have a constitutional defect, that must always be corrected or alleviated. Many weary hours have been spent throughout years in doing the mechanical work of correcting the deformity, only to find the work "go back" simply because the operative cause was not taken into account. If only one thing can

be done, by all means have the adenoids *thoroughly* removed by a rhinologist, and nature will work wonders by way of developing an arch *better* fitted to give to each tooth a place. I may add right here that the work of the rhinologist is not complete unless the patients can close the lips naturally or normally, and this they cannot do in a large percentage of cases unless *occlusion* of the teeth has been established. Thus we see that in order that the best results physically and to the physiognomy may accrue to the patients, they must first have their breathing made normal by the surgical assistance of the rhinologist and the mechanical assistance of the orthodontist.

The plan of treatment depends largely on the age and how much the face is "out of balance." At times the whole lower jaw needs to be brought forward by "jumping the bite;" this is done by widening the upper arch and first moving the molars distally by first ligating the arch to the anterior teeth and tightening the nuts in front of the sheaths on the clamp bands on molars, then the bicuspids in turn, and finally the anterior six. This latter is done by the use of Baker's anchorage, using rubber bands as an intermaxillary force. Then the patient bites forward, bringing the inclined planes into normal occlusion. This plan is followed in children and is the ideal method where the chin is very receding. Retention is made by use of the inclined planes soldered to cemented clamp bands on molars, or, in cases, bicuspids, and *kept* there for a long, "or longer," period, until all tendency for a return has disappeared.

The other plan is by using the Baker anchorage in moving the upper arch back, and the lower forward, equalizing in a measure the inharmony and establishing occlusion.

The old plan of extracting the upper first bicuspids and carrying back the anterior teeth by stationary anchorage has been entirely abandoned by those who believe that a face is only best with its type when the full complement of teeth is present and in normal alignment. Facial art in this first division of Class II. (Angle classification) plays an important part. We can see how hideous our after-results would be, and we must always remember we are changing the faces of human beings created in the image of God, were the patient, with such a plan of treatment, one who had a nose that already had a tendency to incline upward. The angle

of the nose with the lip would be more obtuse by such a procedure, and consequently the nose would look to be at a more hideous angle with the face. I will point out two or three examples of this in the faces shown on the screen.

It will be remembered that, in cases of this class, one of the characteristics is a short and ineffective upper lip. To correct this the patient is given instructions to manipulate by pulling with the finger, and voluntarily moving the lip down and out. After this exercising before retiring for the night, adhesive plasters in strips can be placed from lip to lip, thus compelling the patient to breathe through the nose, and if this is not sufficient, resort must be had to some form of bandage that will hold the lower jaw up.

In conclusion, I want to show you by the slides that these cases of mouth-breathing can be diagnosed without ever seeing the patient, but by simply examining good models, or, if the patient be present, without any examination of the nose, but simply by the relationship of the first premanent molars and the character of the superior incisors.

If the lower first molar, in its relationship to the upper first molar, is distal to normal and the upper incisors are protruding like a fan, you may be sure your patient has, or had, nasal obstructions, which in turn have caused mouth-breathing.—*Dental Summary.*

DENTISTRY, AND ITS RELATION TO MEDICINE. By J. M. Murphy, D.D.S., Temple, Texas. This subject has been, ever since the beginning of dentistry as a separate and distinct profession, one of vast interest and importance to those of both medical and dental professions, whose interest was that of the relief of suffering humanity. Medicine, one of the oldest, most noble and honored of all professions, is the mother of the various specialties. Now, were I to ask you the relation of rhinology, obstetrics or surgery to medicine, you would naturally reply that they are branches of medicine. So I, in beginning, will say dentistry is a branch of medicine just as much as any of the other specialties. Then perhaps you will say, why do you have the degree of D.D.S. to designate Doctor of Dental Surgery and M.D. to cover all other various branches? That is a result of necessity. Dentistry was and is a necessity, and as the perpetuity of any knowledge

depends upon its being imparted to others, dentistry had to be taught and the medical colleges had made no provision for such instruction, so independent institutions had to be established for the teaching of it. Dr. Chapin A. Harris and one or two other practicing dentists of Baltimore attempted to get the medical colleges of that city to establish departments of dentistry, and were refused. Hence in 1839 the Baltimore College of Dental Surgery was founded independently and with no assistance from the medical profession, and hence the independent degree was adopted. At that time dentistry was almost exclusively mechanical, and even that was very crude compared with dentistry of to-day. Pathological conditions of the teeth and oral cavity were not treated successfully by the physician, and, as a natural heritage, the dentist's scope now not only includes the teeth, but the entire mouth. And for progress I unhesitatingly state, without fear of successful contradiction, that dentistry has made more progress in the past fifty years than has any other science, and has contributed largely to the usefulness and success of the medical profession. The medical profession is indebted to dentistry for general anesthetics in 1844. Horace Wells, a practicing dentist of Hartford, Conn., first demonstrated the practical use of nitrous oxid gas in 1845. Dr. Morton, a dentist of Boston, demonstrated the anesthetic properties of ether two years before the same property of chloroform was demonstrated by Dr. T. C. Jackson. Dentistry has contributed all told five general and quite a number of local anesthetics. And to Dr. Atkinson of New York be the credit of restoring, by surgical means, cleft of the palate.

And I think Dr. E. H. Angle of St. Louis has done more toward the simplifying and success of the reduction of fractures of the maxilla than any other individual.

In microscopy and bacteriology, the research work of Drs. G. V. Black of Chicago and Miller of Berlin has been of inestimable value to the successful treatment of the oral cavity, and has been profited by both the medical and dental professions.

From the humble beginning of dentistry, as it existed in 1840, it has grown and developed in knowledge and usefulness to afflicted humanity, until to-day we have included in dentistry men whose practice is limited to that of oral surgery or surgery of the mouth, orthodontia, the correction of irregularities of the teeth

and extracting of teeth, besides those who do only mechanical work. These are all specialties and do not include the general practitioner, whose duty it is to try to cover the entire territory.

And the American people have not been slow to recognize and show their approval of the progress made. About six years ago Congress passed a bill creating the Contract Dental Surgeon in the Army, and so successful has that proven that now there is a bill pending before Congress, and likely will pass, doing the same for the Navy; and all over the country are State and National institutions being equipped for and supplied with dental services. And many of the hospitals and charitable institutions have dentists on their regular staff. In Germany the poor are provided with free dental services in Dental Infirmaries. In Strousberg, Berlin and Dresden the local government provides all instruments, medicines and appliances and furnishes free dental services to their poor.

And the medical profession, as she has ever been looking for all that is good for suffering humanity, recognizes dentistry as a branch of the healing art. And both individually and collectively has the movement toward closer relation been urged by the leading men of both professions, until only a few years ago the American Medical Association established and now maintains a section of stomatology, to which all ethical dentists who are graduates of reputable colleges are eligible to membership. And in Illinois the medical and dental associations have been working through a committee from each toward the bringing together, or rather creating, a closer fellowship between the two. And at the last meeting of the Texas Medical Association a committee was appointed to confer with a like committee of the Dental Association, which was appointed to formulate plans of closer relationship.

But for the associational relations to be successful it must first be crystallized between the individual members. Dentistry by right should be and is a branch of medicine, the fundamental branches are taught the same to all, no distinction being made until the treatment of pathological conditions are reached.

So the relation that dentistry has to medicine is that of any other branch of medicine, and its sphere includes the mouth and its contents.

In the saliva we find mucus, epithelium and particles of food.

These, in presence of the moisture of the mouth and heat of the normal temperature of the body make a culture media in which thrive almost every conceivable microorganism. Tubercular bacilli, pneumococci, diphtheritic focilli, are to be found in the mouths of many people not suffering from other ravage, the system being in a strong and healthy condition, sufficient to ward off any encroachment upon the vitality; thus it is seen in patients sometimes whose vitality has been reduced from some cause that terminates in tuberculosis, diphtheria or pneumonia, without any visible cause.

Streptococcus, staphylococcus, diplococcus and liptathrix baillus are constantly present, and in some cases in teeming millions. There has been isolated by Miller about 200 different kinds of microorganism from the mouth. All nourishment taken by the patient in the natural way is laden with these microorganisms just ready for business, as soon as they shall have been placed in a suitable field for propagation. Hence the casual observer who is at all informed on the character of these organisms will recognize the danger that a patient is subject to whose mouth is filled with the debris of food and years accumulation of calcic deposits, which form an ideal harbor for these virulent germs, and who is to undergo surgical treatment anywhere along the alimentary canal. I do not claim a possibility of rendering the mouth aseptic, but it is an undisputed fact that the more unsanitary and congested is the condition of the mucous membrane of the mouth, the more virulent the character of germs formed therein. Hence it is the surgeon's duty, not only to himself, but to his patient, whose welfare and destiny are largely at his disposal, to have the patients consult a competent dentist and the mouth put in as healthy condition as is possible, before any surgical operation is attempted anywhere along the alimentary canal. And during the period the patient is confined to the bed after the operation this should be watched very closely by the nurse in charge, and if it were looked after more closely than is the practice among the majority of surgeons, I feel safe in asserting that far fewer serious results would follow operations on the stomach and intestinal tract. Again, in cases of dysentery, acute and chronic gastritis, how much greater would the patient's chances of a speedy recovery be by having the mucous membrane of the mouth put in a normal condition,

and thereby reduce the virulent character of the microorganisms of the mouth. This, gentlemen, is a much more important question than I am persuaded the majority of the medical profession realize. Then there are the complications that arise during the period of the first dentition that are serious and often fatal. Dr. B. J. Cigrand, of Chicago, stated in an address last year that in the previous year in one county in Illinois there had been 818 deaths of children, caused by convulsions during dentition. Some of these might have been avoided by consultations between the attending physician and a competent dentist, who might have recognized and removed the cause of the trouble.

In the reduction of fractures of the maxillæ and in surgical operations in the mouth the dentist is best fitted, by reason of his knowledge of the conditions in that territory and his familiarity with the use of instruments in the mouth. This is of no small importance, as anyone who has tried it will readily concede.

In cases of facial neuralgia a consultation with the dentist is indicated, as a large majority of cases of this trouble are traceable directly to dental lesions, and my experience has brought me to the conclusion that pulp nodules are responsible for a greater proportion than anything else. And where this is the case a correct diagnosis is very difficult and requires both skill and an accurate knowledge of their character.

During pregnancy the dentist can be of vast value to the physician, for during this trying period of a woman's life she is sorely vexed with dental troubles, although she has already as much to endure as can be borne by the average constitution.

Syphilitic lesions often appear in the mouth first, and the dentist should be able to detect and make a diagnosis, and refer the patient to a physician.

Dr. Joseph Kidd of London, an eminent surgeon, attributed the prevalence of appendicitis to faulty mastication of foods.

Dr. W. M. Osler, in an address to a class of dental students in London, said that the dentist is a specialist by necessity of his vocation, and his function is:—First, the relief of suffering; second, to increase the digestive capacity of his patient; third, to preserve the beauty of the human countenance.

Suppose that the dentist be eliminated from the citizenship of this country, what a toothless and haggard appearance the major-

ity of the population would present, to say naught of the suffering that would have to be endured.

In conclusion, I will again state that the relation dentistry bears to medicine is the same as that of any other specialty, and the dentist should be consulted by the physician in cases where the mouth and teeth are involved or suspected. And the dentist should at all times refer for treatment all cases of systemic troubles that have local manifestations that come under his observation to the physician. And both should recognize the rights of the other and practice the golden rule, and strive for the closest relationship and work for mutual benefit, the good of suffering humanity and the betterment of mankind.—*Practical Dental Journal.*

THE COLOR PROBLEM IN PORCELAIN INLAYS. By J. Q. Byram, D.D.S., Indianapolis, Ind. Color, for the purpose of this paper, may be defined as the quality of an object by virtue of which it reflects or transmits certain light rays and absorbs others. The specific effect produced upon the eye depends upon the character of the rays that reach the retina; a color examined in sunlight may appear somewhat different when it is observed by an artificial light, because such light is deficient in certain colored light rays.

Some of the phenomena of light, which assist in producing colors, are absorption, transmission and reflection. If a translucent body absorbs certain colored rays and transmits or reflects others, it will appear to be colored by a combination of the transmitted rays. This is commonly referred to as selective absorption, and the colors of stained glass, porcelain, etc., are examples of this phenomenon. Red pigments reflect or transmit red, yellow and orange rays, while they absorb violet, blue and green rays. Yellow pigments transmit or reflect red, orange, yellow and green and absorb blue and violet rays; while blue pigments transmit or reflect green, blue and violet rays, and the remaining rays, red, orange and yellow, are absorbed by these pigments.

If light penetrates a short distance into a body and is then reflected, its surface generally appears to have the color of the reflected rays. Light is not transmitted by an opaque substance, but the rays are either reflected or absorbed. When light is inci-

dent upon an opaque body, it is wholly excluded from the other side, being absorbed or reflected from the surface. Since cement forms an opaque body, it is this phenomenon that causes it to change the color of an inlay.

The pigments most commonly used in the manufacture of dental porcelains are precipitated gold and platinum, purple of Cassius, and the oxides of gold, titanium, manganese, cobalt, iron, uranium, silver and zinc. The colors produced by the use of these pigments in varying proportions are red, yellow, blue, green, brown and gray. Red is not used extensively by inlay workers. All gum enamel frits are tints of red. It may be used in the manufacture of browns and grays, also to build the gingival portion of many inlays.

Yellows: Yellow is the most important color for the porcelain worker. It is used to form the body of most inlays; it adds brilliancy to the browns or grays when combined with them. Yellows of a greenish hue tend to lose their luminosity in yellow light. Two yellows, in their deeper tones, may match each other perfectly, but when diluted to give lighter tints, may differ quite widely. One may be of a greenish hue, while the other may tend toward a grayish.

Blues: This color is used to build the body of the incisal or occlusal portion of inlays for those teeth with blue incisal edges or cusps. There is a variation in tone from greenish blues to those of a reddish hue. Blues of a greenish hue appear to be more translucent.

Other Colors: Green is seldom used alone; it may be added to blue to increase its translucency. Browns are used to build the gingival portion of some inlays and for the body of inlays for discolored teeth with a brownish hue. They may be added to yellows to sadden them. Grays are used to build the middle and incisal or occlusal portion of many inlays. They are also used to tone yellows and blues.

The intensity of a color is partially governed by the thickness of the mass. Two or more shades of a color can be made of the same porcelain by varying the thickness of the body. This fact is important in the application of colors. For after a color has been applied and fused, it is often found to be changed. The trouble arises from this: The layer of porcelain enamel is so

thin that it is highly translucent and the underlying colors are reflected through it.

A study of the colors of the teeth should be made before the porcelain for the inlay is selected. While the pigments of the tooth determine its color to a large degree, the thickness of the dentin and enamel and the density of these tissues, with their power to absorb, transmit and reflect light, are also factors. The colors of most teeth containing no foreign pigments are brown, yellow, blue and gray with a yellowish or bluish hue. Normal dentin is some shade of yellow, while the enamel contains a variety of colors.

The variation of color so often noticeable when an inlay is cemented into its place is quite perplexing. The inlay may be a good match when the incident of light is at such an angle as will permit of its transmission. But when the angle of incidence is changed, some portion of the inlay may appear a different color. The cement is also a factor in this phase of the color problem. If it were transparent it would not prevent the passage of light through the tooth. But when light is incident upon a tooth containing an inlay, it is partially excluded from the dentin on account of the layer of cement, and the color of that part of the tooth and inlay which is in contact with the cement may differ from the other parts because of the unequal absorption and reflection of the rays. Moreover, a "shadow" is formed when an inlay is cemented into a cavity with a cement which dimly reflects and partially absorbs the transmitted rays, if the incidence of light is at such an angle that the unabsorbed rays cannot be transmitted.

One of the phases of inlay work which always will be perplexing is the difficulty in obtaining colors that accurately match the natural teeth. When we consider that a tooth is composed of both organic and inorganic materials, with a variation of the density of these substances, and colored with pigments peculiar to it, we can readily understand how difficult it is to match tooth structure with a substance, inorganic in composition, differing in density, and colored with different pigments. Still, with the improved porcelains of today we may accomplish results with which we may justly feel a considerable degree of satisfaction.

There is a difference of opinion regarding the application of

porcelain for inlays. In dentistry, as in other professions, it is hardly to be expected that all should accomplish the same end by the use of the same means. While, however, in this matter of inlay work, we are all striving for the same result, namely, a serviceable esthetic filling that accurately replaces the lost tooth structure. There are different methods of applying the colors in the construction of an inlay. Some build their inlays in layers, some prefer to mix the colors, while still others prefer to construct them by lightening the porcelain to counterbalance the change of color caused by the cement and to color the cement with pigments to approximate the color of the tooth. The method of lightening the porcelain may have some advantages, but it is open to criticism. It may be advantageously applied to labial cavities, for the angle of incidence is always such that the rays are feebly reflected and partially absorbed by the cement. It seems hardly possible to construct inlays for proximo-incisal cavities, requiring two or more colors, by lightening the porcelain and coloring the cement to match the different colors of the tooth. The sameness of color in these large inlays is also objectionable.

To Dr. W. T. Reeves belongs the credit of suggesting a method of building inlays in layers. His method is to bake a foundation layer or body to correspond to the dentin and then to apply enamels in different parts to correspond to the color of the tooth. He says: "Each color put on must be baked by itself. If you attempt to lay one color on another and bake at one baking it will result in the mixture of colors; while if baked separately each will preserve its identity. Put your colors on strong enough that when covering with what might be called an enamel layer, it will allow the colors to reflect through the enamel layer, modifying and harmonizing the colors. Dr. Reeves claims for this method a more translucent inlay, avoidance of shadow and preventing the cement's reflecting from beneath. While this method of constructing inlays may assist in overcoming these difficulties, it does not wholly remove them. This method obviates the necessity of lightening the porcelain and adding pigments to the cement. It also breaks the uniformity of color so often noticeable in inlays constructed of a monochromatic porcelain.

There are conditions under which I deem it advisable to mix colors in the construction of inlays. The yellows may need to be

toned with grays; the grays to be brightened by the addition of yellow. Or the blues may be brightened by the admixture of green, or saddened by the addition of gray. I would not have you infer that I construct most of my inlays by mixing colors. However, I find that, in many cases, the mixing of colors gives better results than I can obtain by applying the colors in layers. The change of color in an inlay, caused by the cement's absorbing and reflecting the light rays, will be noticeable whether the inlay is constructed of a monochromatic porcelain, by mixing the colors, or by applying the colors in layers.

Mr. Robert Brewster has produced a white opaque porcelain for lining matrices. It is of a bright, reflecting character and dense enough to assist in counteracting the effect of the cement's absorbing the light rays. He says of it: "The matrix lining, as I have called it, promises to be a solution of a very vexing problem, the change of color in inlays caused by the cement. It is for the profession, however, to decide its efficiency by using it in various positions in the mouth, and especially those that prove most trying as regards shadows. Building inlays upon a white base also has other advantages. It simplifies the procedure of color selection and obviates guess work. If desired, this body may be used entirely as a foundation body and the enamel body laid directly over it with the intervention of a yellow foundation. In any case, it should be used, wherever possible, of sufficient thickness to insure a full measure of opacity and be brought to a high glaze." I have used this lining to good advantage in many cases, but I have been disappointed in the results obtained with it in others. It requires considerable experience to apply the colors over this white opaque lining in such manner as to produce a proper color effect. If the enamels are applied in thin layers over this lining, darker colors should be used to prevent the lightening of the colors of the enamel by the lining. Care must be exercised to prevent the lining coming too near the margins or the colors along the margins will be lighter.

I believe the method of constructing inlays of two bodies differing in fusibility to be the correct one. The foundation body can be thoroughly fused, and when the enamel colors are placed in their respective locations and fused, the two porcelains give a

more natural combination of color than can be produced by a single body.

Many porcelain workers prefer to apply each layer of enamel and thoroughly fuse the porcelain before the next layer is applied. But I prefer to apply each layer and fuse to a high biscuit, only heating the porcelain to the point of glazing at the final fusing. If a layer of porcelain is fused and then another layer of the same material is added and thoroughly fused, the first layer will be slightly over-fused. Hence, in the process of applying porcelain in layers and fusing each layer, the underlying layers will be slightly over-fused and somewhat lighter in color.

In the selection of colors for an inlay note the variations in color of the natural tooth. There are usually three or more colors, or shades of colors, in a tooth. The foundation of an inlay, representing the dentin, should be yellow (presuming that the tooth is vital), and the overlying colors should approach the color of the enamel in their respective positions. If the matrix lining is to be used, a thick layer should cover the matrix to within about one-half millimeter of the margin and be fused to a high glaze. The foundation body should be applied over the white porcelain and be contoured to replace the dentin. It should be fused, provided it is of a higher fusing porcelain than that used to replace enamel. Care should be taken to prevent porcelain of different colors from mixing when applying them to their respective positions. If the colors are applied separately and biscuited, then a uniform color is applied over the entire mass and properly fused; the colors will be true and the fused porcelain will approach more nearly the natural tooth structure in appearance.

The uniformity of color in porcelain is dependent upon the accuracy of the fusing. It is difficult to fuse porcelain at a definite degree of heat without some means of measuring the degree of heat used. Many otherwise good inlays are spoiled in the furnace. Then, too, variations of the heat of the muffle will cause differences in the shade and the strength of the porcelain. Under-fused porcelain is of a duller hue and is less translucent, while over-fused porcelain is lighter and has more of a glass-like appearance.

Because of the opacity of low fusing porcelain it is impossible to construct inlays of this material for teeth of extreme translucency that will match as well as inlays constructed of high fusing

porcelain. But the low fusing porcelain more nearly imitates the color of the natural teeth in cavities on the labial surfaces, because the opaque porcelains absorb and reflect light from the surface, thus causing less change by the cement.

In conclusion permit me to say that many dentists criticise porcelain inlays because it is possible to detect them. While the ideal inlay should replace the lost structure so accurately that it cannot be detected, yet I fear it will be some time before we attain such perfection. Let us meet conditions as they really are, and strive to perfect ourselves in this branch of dental art, so that we may give to our patients fillings which in a measure disguise the artificiality of our work.—*Dental Review.*

DENTAL AMALGAM. By F. J. Spargur, D.D.S., Cleveland, Ohio. Amalgam has been in use as a dental filling material in this country something over half a century. We learn from a study of the article on plastic filling material by Burchard in the "American Text-Book of Operative Dentistry," that an amalgam composed of coin-silver and copper combined with mercury was used in this country first by a couple of charlatans. The material and the methods of those introducing it were severely condemned by the dental profession of that time. Not until some years later was an alloy of silver and tin introduced by Dr. Elisha Townsend of Philadelphia. The standing of Doctor Townsend as a practitioner of ability served to remove in a measure the ban placed upon amalgam. But shortly after this it was again very generally condemned.

A realization on the part of prominent men, however, that gold as a filling material had its limitations and that amalgam properly handled could in a measure supply the deficiency, led to its almost universal use. Amalgam, as we have seen, made its entry into the dental cabinet under a cloud, and under a cloud it has to an extent remained to this day. I do not remember having seen, of late, a paper in any dental publication dealing with dental amalgam, its uses and abuses. Any number of articles appear and reappear concerning porcelain, bacteria, pyorrhea, the dental pulp, and other matters of interest, but the subject of amalgam is for the most part left severely alone. Who of us can remember a dental clinic where amalgam was the star attraction? I infer that the reason

for this is that amalgam is a commonplace material outside of our offices, where—unfortunately, perhaps—the practical, if not the prosaic, side of our profession holds the center of the stage, to the exclusion of the more ideal and scientific side which is so in evidence in the deliberations of our meetings and conventions. I contend that, as in the past, so in the future, will amalgam play a large part in the struggle to combat decay of the teeth.

We must concede, no doubt, that in some offices amalgam is slightly in evidence. The fact remains nevertheless that among the rank and file of dental practitioners the alloy and mercury retorts are more often reached for than all the other filling materials combined.

The essayist contends:

First: That amalgam, if properly and intelligently used, is a worthy aid to the conscientious operator.

Second: That a good amalgam filling is a far better tooth saver than an indifferently-made gold filling.

Third: That a filling made of cohesive gold in proximo-occlusal cavities, is not as long-lived as a good amalgam filling in the majority of cases.

Fourth: That large cavities, in which gold, tin or porcelain are contraindicated, can be filled successfully in many cases with amalgam.

Fifth: That many teeth are crowned which would be better saved by restoring with amalgam.

Sixth: That no material at the dentist's disposal is so roundly abused and so slovenly used as amalgam.

The writer desires it understood that he considers an amalgam filling "good"—as a general thing at least—*only* when it is used *over* a cement lining.

If the above contentions are correct, why does not the profession pay more attention to ways and means to bring out the best there is in this much-maligned material? The essayist has reason to believe that many men in our profession—he would like to say the majority, but fears that would be an exaggeration—give to the subject of amalgam careful and conscientious thought, and to its manipulation painstaking effort. To those who are guilty of foisting upon their trusting and helpless patients the *"hurry-up"* amalgam monstrosities which we so often see, is this paper directed.

The essayist has no thought of presenting anything new or original. He merely desires to urge the oft-repeated maxim that "Whatever is worth doing at all is worth doing well;" and to call attention to a few methods tried and found efficient.

It is essential that wherever possible dryness should be secured and maintained throughout the operation of filling a tooth with amalgam. This is usually most easily obtained by the use of the rubber. The thorough desiccation of the cavity insures a minimum of pain in excavating, an unobstructed view of the field of operation, the detection of small particles of decay, or small decalcified spots on cavity margins, and other defects that would not be so certainly detected if the cavity were wet or even moist. It must be conceded that there are operators so expert in the use of napkins that a fair condition of dryness can be maintained without the rubber, but there are few such. It will be argued, perhaps, that the time spent in adjusting the rubber—the expense, perhaps—is out of proportion to the advantages. This may be so in offices where "anything goes" and where the application of the rubber posterior to the cuspids is an event. I would earnestly advise those in this class to acquire the rubber-dam habit.

In the preparation of cavities for amalgam, cutting in the way of extension for prevention and the preparation of cavity margins should be as thorough and painstaking as for gold. The dentist who merely cuts out pits of decay in the sulci of molars and bicuspids instead of following the sulcus to the end, who leaves overhanging frail walls with rough, uneven margins, may pride himself on being a rapid operator—a very smooth article—and by some process of thought, more wonderful than wise, consider himself an honest man. He is, however, eligible to membership in the great society of grafters. He may be a member of honorable dental organizations—for a slovenly workman may be ethical according to the code, may boast at the city, county or state meetings—prate fondly of porcelain inlays, original research, and what not. He may deceive himself, but his fellow-practitioners know him for what he is—a mighty poor dentist whose aim is the almighty dollar by the quickest route.

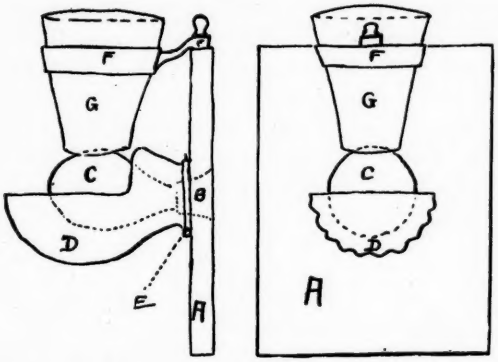
The writer, from experience and observation, has been led to believe that there are few instances where it is justifiable to place

amalgam in a tooth cavity withut a lining, preferably cement. The following method has its advantages. A thin mix of oxyphosphate of zinc cement spread on the floor of the cavity—immediately burnishing a small amount of amalgam into it, thus spreading the cement in all directions. Then clean the margins thoroughly, after which complete the filling with the remainder of the amalgam mix, which has been worked between the fingers during the preliminary work to retard crystallization. In this way an amalgam inlay is had in effect, insuring retention, and lessened shrinkage. It is possible by this method to reduce cutting for retention, in sensitive conditions, to a minimum. Oxychlorid of zinc is also used as a cavity lining, but is at a disadvantage in that it is not sticky. It is valuable because of its germicidal properties. The too common way of mixing unknown proportions of alloy and mercury in the palm of the hand is an unscientific method of procedure. It is indicative of the "hurry-up" dentist. Definite proportions of alloy and mercury should be determined by weight —the mixing done in a mortar to insure thorough amalgamation. Excess of mercury should be expelled by means of squeezing the mass in chamois skin, or otherwise. The degree to which the expression is carried is to be determined by the nature of the filling and the time necessary to insert it. The use of mortar and pestle in mixing amalgam in no wise injures the material in so far as the writer has been able to determine alloys after Black's formula—the medium and quick-setting—it is believed produce the most satisfactory results.

If the operator will take the time and pains to polish his amalgam fillings he will be the gainer in the estimation of his patient—to say nothing of his own satisfaction as he inspects finished operations. Amalgam fillings so polished will not tarnish to any great extent in many mouths. The filling of simple occlusal cavities in bicuspids or molars, or the restoration of portions or even entire crowns, is within the reach of careful expert amalgam manipulators. The dentist who has developed that most important attribute to a successful and finished operator, "the ability to take pains," will feel no sense of shame as he contemplates a well-made, well-contoured, brightly polished amalgam restoration.—*Dental Summary.*

AN ELECTRIC WATER HEATER. By Dewey D. Smith, D.D.S., Sandusky, Ohio. No doubt there are other dentists who have been looking for some kind of a durable water-heater, easy to make and with but little cost.

A—The foundation is an oak piece 7x9x1 inch, which I sandpapered and then weather-oaked, later rubbinb with paraffin dissolved in gasoline, to give it a Flemish oak effect, and, too, making it so that water splashing upon it would not spot the oak.



B—A wall socket countersunk in from the rear of the board.

C—A 16-candle-power electric bulb.

D—A green reflector.

E—Brass rim to hold reflector. Cut out the inner rim, drill holes and nail to the board.

F—Glass-holder taken from the dental bracket.

G—Shell drinking glass. (If a glass can be found with a concavity in the bottom, to catch more heat, so much the better; then a lower candle-power lamp could be used.)

The wires on the back of the board are laid in grooves. In case a switchboard is not used, a small switch could be placed just below the lamp. Or the reflector omitted and the unscrewing of the lamp would act as a switch.

Instead of this method some use a large earthen vase with a lamp fastened in the bottom with plaster of Paris.

Others use the heat from their resistance-coil, in cutting down a high power current.—*The Dental Summary.*

TEACHING ORAL HYGIENE IN THE PUBLIC SCHOOLS. By W. O. Talbot, D.D.S., Biloxi, Miss. The subject of oral hygiene now ranks among the first in the minds of the dental profession, for in unhygienic conditions mouths become diseased and the teeth decay. Palliative and reparative treatment only gives temporary relief and we see the most perfect operations in dentistry fail and go to nought as the teeth are lost from disease caused largely by neglect in keeping the mouth clean. If the agonies of odontalgia are to become a rare affliction, if dental operations are to be as permanent as the scientific correctness of their performance now justifies, if the natural teeth of the civilized people are to be preserved in a condition to perform their most important function, mastication, the hygiene of their mouths must be greatly improved. To meet these requirements the mouth must receive a careful personal attention throughout the life of the individual. Cleaning the mouth should be made a part of the daily toilet, to be observed as strictly as the care of any other part of the body. The people as a whole do not know this. They must be taught. To teach a nation, you must teach its children. The public school is the best place to teach people simple truths that every one should know, and to force the beginning of a practice of things that every one must do.

The dental profession has largely awakened to the necessity of oral prophylaxis, and that it is obtained only through the observance of the laws of hygiene. Papers read before the various dental societies of this country during the last seven years, together with the actions and the discussions thereon have proved most conclusively that the dental profession in America believes that oral hygiene should be taught in the public schools of the country.

The medical profession has observed in unhygienic and toothless mouths the cause of many of the disorders of the digestive tract; and it is often demanded that such mouths be put in a healthy condition and be provided with sufficient teeth for proper mastication of the food in order that the digestive organs may yield to medical treatment and be restored to their normal functions.

In states where lecture work has been done among the teachers, they have favored and in some cases have expressed a desire to

teach oral hygiene in the public schools. Parents whose attention has been called to the subject, and to whom the plans have been explained, have favored the teaching of oral hygiene in the schools. The campaign has been carried on in many places to such an extent as to prove that the people want such teaching. Then the question is no longer whether nor why, but *how* should oral hygiene be taught in the public schools?

So far there are two practical plans by which the subject may properly be introduced in the schools: One, in the form of a separate text-book, and the other by a chapter in the physiologies. The separate text-book is best suited to the cities and the separate school districts where the books can be used as supplementary readers and furnished by the schools in the libraries, as valuable works on many other subjects are now used. Supplying the books in this way seems to be the most practical for the present, as it lessens the expense to the poorer children, and overcomes the opposition on the part of many of the school officials to increasing the number of books in the curriculum, to do which would require a change in the school law of most of the states.

The introduction of a well written chapter on "The Care of the Teeth" in the elementary physiologies, to be used in the country schools, seems to be the most practical way of instructing these children, as they do not have the benefit of the libraries as supplementary school books.

The difficulty in the way of the first plan is that there is no book published suitable for the purpose. Let us hope that one will soon be on the market.

The difficulty in the way of the use of the chapter is that in many states the adoption of school books is had by counties, for a term of four or five years, and so allowing the use of several physiologies in a state, not any one of which may contain a suitable chapter on the care of the teeth. State adoption is rapidly taking the place of county adoption, and the various state dental societies should make use of their opportunities to see that whenever there is a state adoption of a physiology it contains a suitable chapter on "Oral Hygiene" or "The Care of the Teeth."

In justification of the above plans and as evidence of their

practicability, I might relate the work done by the Mississippi Dental Association along these lines.

In April, 1898, a paper was read before the Mississippi Dental Association on "Oral Hygiene," advocating teaching the subject as a separate text in the public schools. The association appointed a committee with full power to act and authorized them to take such steps as they deemed best to secure the teaching of such work. The committee decided to prepare a text-book and to make an effort to have it introduced in the schools. The state superintendent of public education was consulted and arrangements made between him and the association to have dentists deliver lectures on "Oral Hygiene" to the teachers at the various state normals. Lectures were also delivered in many places to the children in the school rooms. This work was kept up for two years, giving instruction and preparing the teachers and the people for the introduction of the subject. The expense of this was borne by the individual dentist who did the work. At that time text-books were adopted by county boards..

In 1900 a bill providing for state adoption failed to pass the legislature, which made it impracticable to get a new subject in the schools. In the meantime the text-book committee of the association had been at work. Since that time they have completed a text-book on "Oral Hygiene" which had been approved by the association. As yet the book has not been published for want of satisfactory arrangements with school book companies for publishing and handling the same.

In 1904 the school law of Mississippi was changed so as to provide for state adoption of all school books. However, the change of books was not made until 1905. At this time the sentiment of the teachers of the state was in favor of a chapter on "Oral Hygiene" being inserted in the physiologies. At the April meeting of the Mississippi Dental Association, a committee was appointed to confer with the state text-book commission with a view to securing the insertion of such a chapter. The committee prepared the chapter and succeeded in having it inserted in the elementary physiologies to be used in the state. The state superintendent asked the Dental Association to send lecturers to the two largest teachers' normals to be held in the state this

year, and at the state's expense. These lectures have been delivered, one of which was by the writer, at Clinton, Miss., on July 3, to about three hundred and fifty teachers. Persistency has accomplished something in our state as it will also do in others.—*Dental Summary.*

EXTENSIVE BRIDGING AFTER PYORRHEA. By Frederick Primrose, Baltimore, Md. The purpose of this paper is to give to this society the writer's experience in the treatment of those cases of pyorrhea alveolaris that are commonly discarded by our profession as hopeless. We therefore pass the initiatory stages in this devastating malady and call your attention at once to cases where the teeth are either useless because of this disease, or the loss of many of them has destroyed occlusion, thus rendering mastication painful or impossible.

The Invincible Armada sent by Philip to conquer England anchored off the island bearing the confidence of Spain's haughty ruler that he would crush the pride of England's Virgin Queen. The little English vessels, almost microbic when compared to those Spanish three-decked men-of-war, went forth to attack those masterpieces of naval construction, and ruined that proud fleet, so that there remained to return to Spain only a few scattered hulks. So those beautifully placed dental arches, anchored securely in the dental cavity, which in early life seemed invincible, have been attacked, torn asunder, devastated by the onslaught of interstitial gingivitis until there remain to return to the dentist only a few scattered hulks on which to build a comfortable and useful denture. Can it be done? Would the operation be justified?

We answer, Yes! Experience says "yes," and nature has proved that she will help us. Our experience dates back at least fifteen years, and we have yet to regret our first case.

As soon as a man advocates a procedure contrary to the accepted teachings and opinions of men, so soon must he meet with opposition. Nevertheless it is man's duty to man to give to his profession his practical experience, the untarnished truth of his scientific methods and results. Progress means opposition, and one has only to consult history, whether civil, political or pro-

fessional, to prove it. Truth must prevail; ignorance and superstition must fail.

To repeat, we do not base upon the experience of a year or two, but present the result of methodical observations covering years of experimental procedure, culminating in all the collateral and correlative factors which go to make up the purpose of this paper. Thus we speak "with authority," knowing that experience has taught us to lay aside much of early teaching and to do things contrary to accepted ideas. Let me quote from Dr. Kirk's admirable paper on "Scientific Methods in Dentistry:" "The gradual evolution of truth, the discovery of facts, the correlation and organization of knowledge, and its formulation in the exact terms of scientific record, have kept up an increasing antagonism with that element of social organizations which shrinks from advancement, which protests against the substituting of the new for the old, and which is content with things as they are. It is unnecessary to cite instances, as we are all familiar with the general fact, and history furnishes many classic examples where the protest of conservatism against the progress of scientific truth has been recorded in acts of bloodshed and homicidal vengeance."

The dentists of the past, and many of to-day, are too ready to throw nature to the winds, and rely upon their mechanical and physical knowledge alone to substitute dentures where either disease or criminal extraction has in part deprived the individual of his teeth. They forget, or never knew, that there is a vis medicatrix naturæ; and has not nature been kind in distributing her healing power to the oral tissues? When necessity demands her help she responds magnificently, if only the dentist knows how to bid her.

Take a miserable discarded tooth, rid it of its filthy environments, make it absolutely or nearly immovable, and you will be surprised at the amount of work that tooth will accomplish. Here is science, here is progress, and it is measurable by the degree to which we utilize these offending members.

The point of this paper is this: Make use of every one of these teeth, or parts of them, wherein lies a spark of vitality.

The old adage which applies to the loaf also applies to the

tooth. Half a tooth is better than no tooth. We find in the phagedenic forms of pericementitis that one root may be entirely pulpless, partly necrosed, lying in position as would any foreign body having no physiological connection with its alveolus, while the other root or roots are fairly firm and healthy. In these cases bisect the tooth, or amputate the root or roots, as circumstances may demand or your experience directs. You will find that the remaining portion or portions will take upon them a double share of work, and not only become healthy and firm, but will prove of the greatest benefit in securing and putting at rest the other diseased teeth.

We give you here a truth. The physiological reasons we know not, but the fact may be seen in scores of mouths attacked by pyorrhea. "A pulpless tooth is far more immune from attacks of this disease than is a perfect one." We recall a case exhibited at a recent clinic. Every tooth in a man's mouth had been attacked by pyorrhea save one, and the pulp of that had been devitalized in early youth and the tooth was absolutely healthy. Why attempt to save pulps when their retention hinders thorough treatment for the removal of the cause, and complicates and intensifies the operations?

Every operator has his modus operandi giving him more or less success, but thorough sterilization and antiseptic filling of root-canals are as essential in dentistry as in more vital surgery, and failure is, comparatively, nil.

But how are we to restore those lacerated and loose teeth so that they will become healthy, useful and comfortable members? We answer, Unite them as abutments for bridgework. In a bridge properly placed the force is equally distributed. With the combined resistance of the several bridged roots and a correct occlusion, a condition of perfect rest is brought about. The cause being removed, nature will respond, giving happy results to both the operator and the patient. Let me quote from a recent article by Dr. C. J. Grieves: "It is the writer's firm conviction that the return to health of a denture disorganized by pyorrhea can be more readily accomplished by cleanly fixed bridge work as a splint, and the healthy exercise which it guarantees to the teeth, alveoli, and associate membranes, than by any other known means."

Let me cite a case in the upper arch. The solitary hulk that remains may be a molar on either side, a cuspid, or it may be a bicuspid; probably a plate has been worn (plates are precursory to this disease, especially if worn at night). Here we have a case for a denture of twelve or fourteen teeth, and it should always be inserted in one piece. The weight of the bridge has no significance so long as the occlusion is bilateral, and even when only partly so the results are good. In such a case one may assure the patient that with proper care and intelligent professional attention a bridge can be worn comfortably and mastication restored almost perfectly for a period of five, ten or fifteen years. What more can be asked? These cases present themselves in middle life or later, and if a denture can be placed which will give absolute satisfaction for ten or even for five years, we claim that the operator is justified in inserting it and will have given an ample quid pro quo for the fee received.

The progressive man learns from experience, and changes must come in his mode of operating. We purpose pleading in behalf of the saddle or bridgework, not only between abutments, but beyond. We use them for strength, cleanliness and comfort. We hear this mode of operating condemned by many teachers, but take it for granted they either have never placed one or have not known how to place one properly. With a saddle placed as it should be the tissues will dip toward the opposing surfaces, making it absolutely hygienic, and the proof may be seen should such a bridge be removed in after years: the saddle will be found as clean and bright as when inserted. In a paper of this description it would be utterly impossible to cover the ground of crown and bridgework. Every man has his own ideas and will practice them; but properly prepared roots, so that bands may be adjusted perfectly, is as essential as laying the foundation for any masterpiece of mechanical construction.

We find it good practice to cut off loose and diseased teeth and let them remain at rest for a season. Carefully cleanse the roots by removing all deposit and unhealthy tissue, polish the roots as far toward the apex as one's experience and judgment dictate, after the mode taught by Dr. D. D. Smith. The improvement will be marked and permanent, and like the graft in the

old apple tree, new life seems to spring forth.

In spite of all our learning, care and skill, we may not be able to save every tooth; as the physician must meet with fatal cases, so must we meet with some failures. However, be not discouraged, nor condemn a mode of procedure because of one, two or more failures. Enough teeth can be saved, even in extreme cases, to ward off the use of the plate by a properly placed bridge, thus restoring as nearly as possible on the scattered hulks a perfect denture.—*Dental Cosmos.*

PROPHYLAXIS.—Many a good man seems desirous of doing something for his patient's welfare and will dose pyorrhea with medicine and, possibly, excite the swollen festoons, and then he wonders why he does not have results. Pyorrhea always has a cause, which in every case is an irritant. It may be a deposition on the tooth extending down below the gum margin. This deposition, of whatever nature, should be removed before it has extended far enough to make pus. The slight irritation of the gum margin should be noticed, whether it be a reddening of the edge or take on the form of a red streak extending down on the gum until it reaches well into the cheek. If this is allowed to remain long enough, there will be a change of form to a deposition of hard deposit, a ring around the tooth which will soon develop into chronic pyorrhea. There is another phase known as the receding gum, which is quite prevalent in many mouths. All these varied conditions are the result of external irritants and must be cured by the removal of the cause.—J. D. PATTERSON, *Kansas City Dental Journal.*

CURE OF SKIN EPITHELIOMA BY DIRECT SUNLIGHT.—M. Hirschberg reports (*Berliner klinische Wochenschrift,* October 9), an interesting personal experience. He had on the helix of the right ear an epithelioma 1.5 centimeters long and 0.5 centimeter broad, which he expected to have removed by the knife. He was obliged to go away, in December of last year, to a mountain health resort at Caux, on the Geuser. He enjoyed four weeks of very fine clear weather, and spent much time walking in the sun. On the tenth day he suddenly discovered that the lower part of the epithelioma had blistered. When he removed the slough he found the underlying skin smooth, dry, and of normal appearance. By continuing the daily exposures to the sun, he found, in two weeks, that the remaining portion of the cancer had become changed like the first. Upon his return home there was nothing left except a pinhead-sized prominence, which felt a little harder than the surrounding skin. This place he touched with caustic potassa, and it was destroyed. Eight months afterward there was no sign of return of the disease, but the helix was thinner than normal in the part which had been affected.—*N. Y. Med. Jour.*

The Dental Digest.

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Where All Communications Should be Addressed.

Editorial.

THE ILLINOIS STATE MEETING.

The recent meeting of the Illinois State Dental Society, held in Springfield, has prompted us to a brief consideration of some phases of society meetings in general, not with a desire to find fault nor to criticize, but with a feeling of fairness and of mutual helpfulness, that improvement and advancement may be made, not alone in the Illinois society but in all societies the country over.

To be of the greatest assistance to the largest number is the true function, and should be the aim of every good dental society. The larger the society becomes, the more difficult becomes the performance of that function. The Illinois Society, after two years of untiring effort on the part of its Committee on Reorganization, finds its membership suddenly trebled. New conditions are at hand, additional tasks for the president, who finds the increased attendance composed of men new in society life, men not trained in society work and proceedings, who know nothing of parliamentary laws and practices. The change that has come about in the society emphasizes the fact that a presiding officer must be, first of all, a parliamentarian. To successfully meet this new condition he must possess the personality, the voice, the self-reliance that will command respect, preserve order and so conduct the sessions that the most may be accomplished in the time allotted.

It has been the practice of dental societies, in the past, to choose very frequently a man to fill the president's chair who was utterly lacking in the qualifications of a competent presiding officer, and as a result the societies have suffered. It is a fact that very few men in the societies do, when elected to the presidency, prove good presiding officers, and yet men must be honored with the highest office of the society in recognition of their services to the

society, be they parliamentarians or not. What is to be done? Is the whole society to suffer that one man, who cannot ably preside, may be honored? The British Dental Association recently solved this problem. The Association honors a member with the presidency each year, as before, but his duties are limited to the calling to order of the meeting and to the preparation and reading of the president's address. The gavel is then turned over to a chairman selected by the executive council, because of his qualifications to preside and conduct the meeting successfully. This change has worked admirably with much gain to the British Association and we predict benefit would result if societies generally would adopt this course.

The plan, often adopted, of having those chosen to discuss the papers, write their discussions, we believe not a good one, for such discussions are usually too long, and many times anything but discussions of the paper under consideration. A man when allowed to write a discussion is apt to go astray; the real subject is lost to sight and new ones introduced, all of which results in a loss of time and a subsequent curtailment of the general discussion. We believe that more good comes, especially in a large society, from a free and unlimited extemporaneous discussion of a *few good papers,* than from the necessarily limited discussion of a larger number. As a rule, there are on the programs of the state meetings too many papers for the time allowed for their consideration.

In conclusion, we will mention another mistake too often made, that of allowing a man to appear on the program advocating something he or his friend has to sell. Such a thing is a disgrace to a society and should never be tolerated. By the majority of the men in the profession such a thing is considered an insult and an imposition, and such it is. Suppose supply companies generally could arrange to have their particular products flaunted before societies by arranging with different members to read papers on their different devices and materials. How long would it be before the Dental Society meeting would be a commercial and manufacturing exhibit, pure and simple? There should be no place on the program, no time for such exhibitions of unethical and unprofessional conduct, such brazen effrontery! If a presiding officer has the requisite backbone it is clearly within his province to declare such an attempt out of order and out of place.

These are some of the things that must be looked after if dental societies are to do their best for the members and the profession. As the Illinois Society has set the pace in the reorganization work and the other states are to follow, let it so shape its methods and policies, its rules of conduct and its standards also, that they may be worthy of recognition and adoption.

The Society did a noble thing when about four hundred of its members with the governor of the state and other distinguished men as guests, gathered at the banquet table to do honor to Senator A. C. Clark, of Chicago, who framed, introduced and secured the passage of the present Illinois Dental Law. The gathering was a notable one. The governor in his toast said that such a thing as the meeting together of a great army of professional men to publicly thank and show appreciation to a lawmaker was unknown. It was a sincere expression of thanks for a great service, a precedent established, worthy of the Society and the profession.

Notices.

ST LOUIS SOCIETY OF DENTAL SCIENCE.

The St. Louis Society of Dental Science has elected the following officers for the ensuing year: Adam Flickinger, President; Emma Eames Chase, Vice-President; Geo. H. Westhoff, Secretary-Treasurer; Richard Summa, Orator; E. P. Dameron, D. O. M. LeCron and F. S. McKay, Board of Censors.

GEORGE H. WESTHOFF, Secretary.

VERMONT STATE DENTAL SOCIETY.

At the thirtieth annual meeting of the Vermont State Dental Society, held at Brattleboro, May 16-18, 1906, the following officers were elected for the ensuing year: President, Geo. O. Mitchell, St. Albans; 1st Vice-President, C. H. Kent, Barre; 2d Vice-President, Harry F. Hamilton, Newport; Recording Secretary, Thomas Mound, Rutland; Corresponding Secretary, Grace L. Bosworth, Rutland; Treasurer, W. H. Munsell, Wells River. Executive Committee, C. F. Meacham, Bellows Falls; A. Z. Cutler, Bennington; P. M. Williams, Rutland.

The next meeting will be held the third Wednesday in May, 1907, the place to be decided upon later.

THOMAS MOUND, Recording Sec'y.

IOWA STATE DENTAL SOCIETY.

The new officers elected at the forty-fourth annual meeting of the Iowa State Dental Society at Des Moines are: President, Wm. Finn, Cedar Rapids; Vice-President, C. E. Woodbury, Council Bluffs; Treasurer, Geo. W. Slingluff, Burlington; Secretary, C. L. Topliff, Decorah. Next place of meeting is Cedar Rapids. C. L. TOPLIFF, Secretary.

MICHIGAN STATE DENTAL ASSOCIATION.

The semi-centennial meeting of the Michigan State Dental Association will be held in Detroit, July 9, 10 and 11, 1906. A most cordial invitation is extended to all reputable practitioners to attend this fiftieth anniversary of the association and a most interesting program is in preparation to celebrate this important occasion.

EDWARD B. SPALDING, Sec'y, Detroit.

NATIONAL ASSOCIATION OF DENTAL FACULTIES.

The annual meeting of the National Association of Dental Faculties will be held at Atlanta, Ga., commencing at 2 p. m., Friday, September 14, 1906. The executive committee will meet at 10 a. m. on the same day.

H. B. TILESTON, Chairman, Ex. Com.
R. M. SANGER, Sec'y, Ex. Com.,
East Orange, N. J.

SOUTH DAKOTA STATE BOARD OF DENTAL EXAMINERS.

The next meeting of the South Dakota State Board of Dental Examiners will be held at Sioux Falls, S. D., beginning July 31, at 1:30 p. m., and continuing through the days of August 1 and 2. All persons wishing to take the examination must send in the examination fee of $10 before July 24. Candidates must bring operating instruments, including dental engine, and such other appliances and materials as are necessary to do crown and bridge work. G. W. COLLINS, Vermillion, S. D.

ILLINOIS STATE DENTAL SOCIETY.

The forty-second annual meeting of the Illinois State Dental Society was held in Springfield, May 8-11, 1906. The following officers were elected: President, Elgin MaWhinney, Chicago; Vice-President, T. P. Donelan, Springfield; Secretary, Arthur D. Black, Chicago; Librarian, J. T. Cummins, Metropolis. The 1907 meeting will be held at Quincy, May 7, 8, 9 and 10.

By a systematic campaign of organization this society has during the past two years increased its membership from less than four hundred to about fifteen hundred members. Officials of other societies who may be interested in this work are invited to correspond with the undersigned.

ARTHUR D. BLACK, Sec'y,
31 Washington St., Chicago.

INTERSTATE DENTAL FRATERNITY.

The annual meeting of the Interstate Dental Fraternity will be held at the New Kimball House, Atlanta, Ga., on Monday, Sept. 7, 1906. The meeting and banquet will be in charge of Dr. Thos. P. Hinman, the Vice-President for Georgia.

Dr. Hinman's well-established reputation as a host is a sufficient guarantee for a good time for all of the fraternity who can arrange to be there. Do not miss it. R. M. SANGER, National Secretary.

WISCONSIN STATE DENTAL SOCIETY.

The thirty-sixth annual meeting of the Wisconsin State Dental Society will be held at Madison, Wis., July 17, 18 and 19, 1906. The program committee is arranging an unusually interesting program. Some of the most eminent men in the profession will be with us, and all indications point to one of the best meetings ever held in Wisconsin. All ethical dentists are most cordially invited to attend.

W. H. MUELLER, Secretary,
21 W. Main St., Madison, Wis.

NEW JERSEY STATE DENTAL SOCIETY.

The New Jersey State Dental Society will hold its annual meeting in the Auditorium, Asbury Park, N. J., commencing Wednesday, July 18, and continuing until Saturday, July 21. Accommodations can be secured with the Hotel Columbia at a rate of $3 per day, two in a room, and $3.50 per day for one person in a room. Write early and secure your room. A smoker will be given the members, guests and exhibitors on Thursday evening, July 19, at 10:30 p. m.

Pennsylvania and the Central Railroad of New Jersey carries passengers from all points to Asbury Park. Over 800 dentists registered last year. Many new demonstrations and clinics will be the great feature of this meeting. Asbury Park is a splendid place on the sea shore to spend your vacation, and the State Dental Society affords the best instruction to help you in your work throughout the year. Cut off from the 18th to the 21st and come and see for yourself. CHARLES A. MEEKER, D. D. S.,
29 Fulton St., Newark, N. J.

News Summary.

DR. GOTHARD, a dentist, died at Charleston, Wash., May 1, 1906.

GEORGE BROCKWAY, 81 years old, a dentist of Brooklyn, N. Y., died May 6, 1906.

JACOB L. WILLIAMS, 82 years old, a dentist of Boston, Mass., died May 15, 1906.

C. W. MILLER, formerly a dentist of Cedar Rapids, Ia., died May 21, 1906.

HILARY LOFTON, a dentist of St. Francisville, La., died of heart disease, May 1, 1906.

J. A. CHAPPLE, 52 years old, a dentist of Atlanta, Ga., died of apoplexy, May 16, 1906.

JOSEPH H. DUNN, 77 years old, a retired dentist, died at Los Angeles, Cal., April 28, 1906.

AZARIAH LANNING, 69 years old, a dentist of Salem, Ind., died of tuberculosis, May 15, 1906.

CHARLES R. GAY, 59 years old, a dentist of Seattle, Wash., died of heart disease, May 11, 1906.

GEORGE H. L. HAAR, a dentist of Philadelphia, Pa., died of an intestinal affection, May 6, 1906.

THOMAS S. LATIMER, 67 years old, a dentist and physician of Baltimore, Md., died May 16, 1906.

R. A. DAVIDSON, a young dentist of Cromer, Ga., died of fulminant appendicitis, May 25, 1906.

C. H. HUNT, who formerly practiced at McGregor, Ia., died from arsenical poisoning, May 6, 1906.

J. EVARTS HITCHCOCK, 75 years old, a dentist of Webster, Mass., died of heart failure, May 30, 1906.

SILAS NEWMAN, formerly a dentist of Eatonton, Ga., Dallas and Fort Worth, Texas, died May 1, 1906.

M. S. WELLS, 59 years old, a dentist of New Richmond, Wis., died from a lingering malady, May 4, 1906.

D. REAVIS, 35 years old, a dentist of La Grande, Ore., died suddenly through Bright's disease, May 9, 1906.

J. D. BURDICK, 50 years old, a retired dentist of Quincy, Mich., died May 1, 1906, of paralysis, at Detroit, Mich.

STEPHEN SHEA, 28 years old, a dentist of Brooklyn, N. Y., became suddenly demented and died, May 31, 1906.

THOMAS B. ATKINSON, 68 years of age, formerly a dentist of Astoria, Ill., died at Keokuk, Ia., April 16, 1906.

MOSES N. HOWLAND, 72 years old, formerly a dentist of Lisbon, N. H., died in May, 1906, at St. Johnsbury, Vt.

R. E. HANLEY, 25 years old, a dentist of Fremont, Neb., died following an operation for appendicitis, May 10, 1906.

PETER MCCORMICK, a young dentist of New York city, died of apoplexy in a Turkish bath at Brooklyn, May 28, 1906.

VARNISH FOR MODELS.—Models may be coated with a varnish made by dissolving white wax in spirits of turpentine.—DR. W. H. ELLIS, in *Dentists' Magazine.*

ABRAHAM B. JOHNSON, 50 years old, formerly a dentist of Kutztown, died at Reading, Pa., of paralysis, May 13, 1906.

T. T. THAXTON, a dentist of Pratt City, Ala., was fatally shot by a man who afterwards committed suicide, April 11, 1906.

FRANK PARKHURST, 42 years old, a dealer in dental supplies, of Chicago, Ill., was killed in an elevator accident, May 12, 1906.

R. S. BAKER, 68 years old, formerly a dentist of Des Moines, Ia., who sustained fatal injuries from falling down a flight of stairs at Lisbon, Ohio, died May 2, 1906.

THE HYPODERMIC NEEDLE.—Before inserting the needle apply a drop of chloroform to the skin; it is antiseptic and anesthetic.—FRANK POLLARD, *Am. Jour. Clin. Medicine.*

STERILIZING MOUTH MIRRORS.—Place the mirrors in alcohol until needed for use. Then wash in clean water and dry with a sterile napkin.—E. M. KAPTAN, *Dental Review.*

A CAUSE OF FAILURE.—Many a filling that would otherwise be a failure can be saved by grinding down an opposing cusp. This is a little point, but it can save many a filling.—F. F. FLETCHER, *Dental Era.*

STERILIZING, POLISHING AND GRINDING STONES.—Brush clean with soap and water with a plate brush, and then dip in a five per cent solution of formalin in alcohol.—*Tri-State Record.*

ADJUSTING THE RUBBER DAM.—If the gums are washed with oil of cloves immediately before adjusting the rubber dam, the pain incident to the application of clamps or ligatures is very greatly minimized.—E. K. WEDELSTAEDT, *The Dentist's Magazine.*

SENSITIVE DENTIN.—I find a saturated solution of potassium carbonate in glycerin very effective for sensitive dentin. Apply to the cavity on cotton and let remain for from ten to fifteen minutes. Non-poisonous.—L. W. JORDAN, *Dental Summary.*

TO REMOVE TIN FROM PLATES.—Small particles of tin adhering to vulcanite plates can easily be removed by mixing mercury with enough alloy so it will not flow and rubbing it over the plate under fingers.—C. W. SIEFKILL, Rolfe, Ia.—*Dental Brief.*

TO MAKE HARD PLASTER MODELS.—Mix the plaster of Paris with one-sixth of its volume of pulverized slaked lime. After the model is dried, place it in a 10 per cent solution of zinc sulphate until it is thoroughly saturated. Remove and dry.—*Dental Era.*

A COMBINATION FILLING.—In the use of soft gold built into a layer of soft cement, followed by cohesive foil and, when subject to abrasion, finishing with gold platinum foil, the good qualities of each ingredient are magnified and the faults of each minimized. The cement is adhesive, the soft gold gives close adaptation, the cohesive gold resists lateral stress in contour, and the alloy of gold and platinum resists abrasion.—CLYDE DAVIS, *Western Dental Jornal.*

TAKING IMPRESSIONS.—In cases that are extremely sensitive and easily nauseated I have found it useful and helpful to sponge the mouth with hydrogen dioxid, then applying a 3-100 solution of eucain to the whole palate.—T. B. HARTZELL, *Texas Dental Journal.*

SWAGING WITH MOLDINE.—By using the moldine as a die the moldine seems to draw from every point pressing the metal right into place when using it for swaging backings on teeth, swaging matrices for gold inlays and porcelain inlays from die.—I. K. DOUGLAS, *Dental Summary.*

BURNISHED GOLD FILLINGS.—Keep your burnisher blued; that is, you want to burnish with a blued surface. If it gets bright, gold will stick to the burnisher and you cannot burnish well. Heat the gold burnisher red-hot and allow it to cool off.—WALTER J. BRIGHAM, *International Dental Journal.*

ARTIFICIAL DENTURES.—All who wear artificial dentures will find great comfort in using glycothymolin in cleaning the plates and for rinsing the mouth. It is very soothing to the mucous membrane, particularly the red spongy condition often met with under plates of rubber.—W. H. CRAFT.—*Dental Brief.*

SILVER NITRATE AND CEMENT FILLINGS.—A filling of oxyphosphate of zinc placed upon a surface treated with nitrate of silver will last a great deal longer and be a great deal better mass than the same mass not having the peculiar effect it gets from this film of silver albuminate.—W. V. B. AMES, *Dental Review.*

HEMORRHAGE AFTER TOOTH EXTRACTION.—Personally I am of opinion that obstinate hemorrhage from alveoli after extraction can be most certainly controlled by means of carbolized resin and alum. I have never yet had a case when this happy combination has failed to do its work.—J. W. TAYLOR, *British Dental Journal.*

ANNEALING MATRIX METALS.—This is best accomplished by grasping the small piece of metal at one corner with a pair of old plugging pliers and holding it in a Bunsen or alcoholic flame until it nears the melting point, then plunge into cold water. This, in my experience, gives a very soft, pliable matrix metal.—THOS. P. HINMAN, *Items of Interest.*

FIRES.—D. J. Kelly, Susquehanna, Pa., May 11, 1906; total loss.—Dr. Lean, Belleville, Ont., May 22, 1906; total loss.—G. A. Hirscher, Merrill, Wis., May 26, 1906; total loss.—A Coyle, Oconomowoc, Wis., May 28, 1906; losses fully covered by insurance.—M. W. Maloney, Woonsocket, R. I., May 30, 1906; water damage; fully insured.—Dr. Parker, Olathe, Kan., May 28, 1906; loss slight.

CAUTIONS AGAINST THE USE OF ADRENALIN.—M. I. Wilbert, in *American Journal of Pharmacy:* Neugebauer reports that he has seen several cases of localized gangrene following the use of solutions to which adrenalin had been added for the infiltration method of local anesthesia. Elderly persons were especially liable to this, and he therefore cautions against the use of adrenalin in old persons.—*Dental Brief.*

THE USE OF ALCOHOL IN SENSITIVE CAVITIES.—In wiping out a sensitive cavity with alcohol, the passing of a pledget saturated with the solution over the flame of a lamp permitting it to ignite and burn for a second or two will warm it and prevent a shock when carried into the cavity. The removal of this pledget and immediately packing the cavity with dry absorbent cotton will greatly reduce the tendency to cause pain by rapid evaporation.—*Editor Dentist's Magazine.* (*Tri-State Record.*)

SPENCE METAL.—Spence metal is composed of sixty parts of sulphide of iron and forty parts of sulphur; the fusing point is 225° F. It is of great value when used as an articulating model, by minimizing the attrition of the antagonistic surfaces, which results when teeth of porcelain are brought into repeated contact with teeth of a plaster model.—*International Dental Journal.*

NEURALGIA OF MALARIAL ORIGIN.—When we are able to determine, by the periodicity with which the pain returns that a patient is suffering from neuralgia of malarial origin, the preparation known as Warling's tincture, in two-drachm doses, is considered by many authorities as superior to quinine for relieving patients affected by this form of pain.—DR. J. E. POWERS. in *Items of Interest.*

REMOVAL OF PULP WITH CALCIFIC FORMATIONS.—In case of failure to anesthetize a pulp with cocain and pressure anesthesia, due to calcific formation in the pulp, I have obtained good results by the application of sulphuric acid. Make the application for a few minutes, then wipe out the cavity with sodium carbonate, and many times you will then be able to anesthetize the pulp.—GEO. W. COOK, *Dental Review.*

SHRINKAGE IN RUBBER DURING VULCANIZING.—Dr. G. B. Snow says the amount of shrinkage depends not alone on the time the rubber is subjected to the process of vulcanization, but also upon the temperature. The lower the temperature and steam pressure, the less the loss in shrinkage and the less the contraction in cooling. Low heat and long time also insure an improvement in the texture of the product.

TO PREVENT PAIN IN LIGATING RUBBER DAM.—Bathe the gums around the teeth to be enclosed in the rubber with a solution of cocain and adrenalin or adnephin for a few minutes prior to placing the rubber and the patient will be very thankful for the relief afforded. I usually take five to ten min. of adnephin and twice the amount of water in making my solution for this preparation. The strength of the solution, however, is immaterial.—*Editor Dentist's Magazine.* (*Tri-State Record.*)

ANTRAL ABSCESS DIAGNOSIS.—If an antral abscess is suspected, let the patient blow his nose thoroughly upon the affected side until no pus is expelled. Then let him, with feet together, endeavor to touch his toes without bending the knees, for from one to two minutes. Extensive aching of the diseased antrum and eventually of the diseased teeth will be induced and a stream of pus will result from renewed blowing of the nose.—H. STOLTE, *Cosmos.*

BABBITT METAL.—This is the only metal having all the fine requirements for a dental die, which are (1) non-shrinkage; (2) hardness, so as not to batter; (3) toughness, so as not to break; (4) a smooth surface; (5) melting at a low temperature. The proper formula is copper, 1 part; antimony, 2 parts; tin, 8 parts, melted in the order named. Do not overheat, so as to oxidize the tin.—L. P. HASKELL, in *The Dentists' Magazine.*

WHERE PRESSURE ANESTHESIA FAILS.—Teeth of old persons; teeth of inveterate tobacco chewers; worn, abraded and eroded teeth; teeth with extensive secondary calcific deposits; teeth whose pulp canals are obstructed by pulp nodules; teeth with metallic oxides in tubules; teeth with leaky old fillings; badly calcified teeth—mainly all from one and the same cause, namely, clogged tubuli. In most of such cases no amount of persistent pressure will prove successful.—GEO. ZEDERBAUM, *Dental Register.*

PAIN AFTER EXTRACTION.—Curette and thoroughly cleanse the alveolus and irrigate copiously with hot water. Apply two drops of pure carbolic acid and pack loosely with sterilized gauze. If the pain does not cease, saturate a small pellet of cotton with campho-phenique, take up with it a small amount of morphin-acetate and carry to the bottom of the socket. The morphin-campho-phenique dressing produces most remarkable results, the pain disappearing almost instantaneously.—DR. ENDLEMAN, *Dental Register.*

DRAINAGE OF ABSCESSES.—There is no place in the human body where care in securing beyond question the complete drainage of abscesses is so important as in the mucous tissues of the mouth. The blood is so rich in this region that cuts close in a surprisingly short time and the formation of pus is often profuse and rapid. Hence we must insist upon the necessity of keeping up the drainage for a sufficient time for the complete cleaning of the abscess. In all cases of the drainage of abscesses in the membranes of the mouth I insist on the use of 95 per cent carbolic acid in the tent. A very small amount retained in the gauze or cotton is sufficient to cauterize the lips of the incision, making the opening freer, promoting the egress of pus and presenting a barrier to the ingress of new infective material.—G. V. BLACK, *Northwestern Dental Journal.*

THE ANTISEPTIC VALUE OF CHLORETONE.—Four or five years' use of chloretone has demonstrated the practical utility of an alcoholic solution for topical application previous to the use of the hypodermic needle in the gums. A ten or twenty per cent solution in seventy-five per cent alcohol may be used, and unlike cocain causes no toxic effect. An application for this purpose should have the following qualities: First, detergent; second, antiseptic; third, anesthetic. The alcohol possesses the first requirement, cutting the mucus and leaving the membrane absolutely clean. The tissue is then readily acted upon by the antiseptic agents, alcohol and chloretone, and sterilization of the field of operation results. Finally, the anesthetic action of the chloretone is had on the tissues and the hypodermic needle can be used with a minimum of pain and no possibility of septic infection.—DR. T. A. GORMLEY, Mount Vernon, Ia., in *Register.*

INLAYS: FUSING THE PORCELAIN.—I have a little square platinum pan which can be handled from any of its four corners, the bottom of which is perforated. By placing this pan on a piece of lead and driving a broken excavator through it with a small hammer, I formed a burr or projection around each hole, so that when the asbestos paste is put in it, and the matrix adjusted to position, it can be placed upon the hottest furnace without danger of blowing out the investment by the formation of steam.—F. T. VAN WOERT, *Dental Cosmos.*

MOUNTING PORCELAIN BRIDGES.—Porcelain bridges should always be mounted with gutta-percha in preference to cement, because of three important features: First, when so mounted they may be removed at any time without difficulty or injury; second, the impact from the stress of mastication is relieved by the cushion-like effect imparted by the presence of this material, and third, it is almost impossible to use cement when a saddle is employed without forcing the surplus underneath it, and when this crystallizes irritation is the invariable result.—HART J. GOSLEE, *Dental Review.*

FATALITIES.—May 4, a Canadian succumbed at Los Angeles, Cal., to blood poisoning from a dental operation.—May 12, a young man died from cirrhosis of the jaw at the University of Pennsylvania Dental College, resulting from an ulcerated tooth.—May 17, a noted criminal lawyer of Knoxville, Tenn., died from blood poisoning, the result of an ulcerated tooth.—May 19, a 7-year-old boy of Belleville, Mo., died of blood poisoning, following the removal of an ulcerated tooth.—May 21, an Indianapolis merchant succumbed to blood poisoning, which followed the extraction of a diseased tooth.

FLASK FOR DUPLICATING PLASTER MODELS WITH GELATIN.—This mould consists of four pieces constructed of brass base plate, five and one-half inches in diameter, with a groove one-sixteenth inch deep, extending around the plate one-fourth inch from the outer margins. Into this groove fits a ring of brass which is two inches high and one-sixteenth inch thick. The ring is made of two parts and held together by a metal band, assisted by the groove in the base plate. Thus it will be seen that the mould can readily be separated and gelatin, which is very tenacious, be easily removed after setting.—H. S. KEELER, *Brief.*

HABIT.—Habit is an art to be taken into consideration in a dental education. The power of habit either strengthens or weakens the will almost beyond belief. Habit creeps upon us so subtly that we are bound before we are aware of the habit. Our likes and dislikes will be as our habits are. Make sobriety a habit and intemperance will be hateful to us. Make prudence a habit and recklessness will be intolerable. We may put ourselves in the way of acquiring any habit we may desire, habit of industry, habit of study, habit of patience, habit of thought, habit of beginning in our office at the right time. So may evil habits be overcome by avoiding all things leading to these habits. The formation of a habit reduces this simple plan. Apply yourselves to a given plan industriously, punctually and persistently.—DR. BROWN, *in Dental Summary.*

RICHMOND METAL.—This metal offers the great advantages of very low fusing point—160 degrees, fifty-two below boiling water, enabling you to run a model over a gutta-percha impression. The formula is as follows: Tin, 20 parts by weight; lead, 19 parts by weight; cadmium, 13 parts by weight; bismuth, 48 parts by weight. In swaging a matrix take impression of cavity with gutta-percha, invest in plaster. It is not necessary to wait for plaster to thoroughly harden or dry; two minutes is ample time when you can run the Richmond metal, giving a metal die on which to swage a matrix.—J. P. ROOT, *Kansas City Dental Journal.*

NITROBENZIN AS A DRESSING FOR WOUNDS AND OTHER SURGICAL APPLIANCES.—Crouzel recommends the addition of artificial oil of bitter almond (nitrobenzin or oil of myrbane) to ordinary benzin to make it more acceptable as a wound dressing. Guaiacol also may be used for this purpose. For local application various alkaloids and other drugs are soluble in benzin and can be used in this way (quinin, morphin, strychnin, also camphor, iodin, sulphur, phosphorus, etc.). Solutions of paraffin and of gutta-percha in benzin enable us to make impermeable dressings for a wide range of purposes. In dressing painful wounds, the benzin may be made strongly anesthetic by the addition of menthol. The local anesthesia obtained in this way will permit of the incision of paronychia and certain abscesses. The addition of 5 per cent of petrolatum to benzin will protect surgical instruments from rusting if after cleansing and sterilization they are dipped in it and withdrawn.—*Journal de Médecine de Bordeaux.* (*Stomatologist.*)

A PRESCRIPTION FOR FACIAL NEURALGIA.—Twenty years ago I began experimenting to find a remedy or a combination of remedies that would cure facial neuralgia, and at the same time one that would not exert a baneful influence upon the animal economy. In my experimental researches I have used over one hundred different single remedies, giving each a thorough test, with the result that many of them would benefit some cases, while in other cases the same remedy would have no effect on the complaint. I found that compound remedies are more creative than single remedies. For one combination I have written over 300 prescriptions during the last ten years, and it has given perfect satisfaction to my patients and to myself, as it is a positive cure for nerveache of the fifth nerve, and will not disappoint you. The prescription is:

Lloyd's specific aconite, twenty drops.
Lloyd's specific rhus tox, twenty drops.
Lloyd's specific gelsemium, one dram.
Fluid extract tongo, two drams.
Elixir aromatica, sufficient to make four ounces.

Of this give one dram every two hours until relieved; then for every four hours until cured. It will take from three to five doses to bring the system under the influence of the remedy, which will be manifest by a tingling sensation in the ends of the fingers. The above is the adult dose. The intelligence of the physician will modify the dose to the requirements of children.—*Chicago Medical Lines.*

CAVITY PREPARATIONS UNDER NITROUS OXID.—The preparation of cavities with nitrous oxid and oxygen is one of the most satisfactory methods I have ever used. With this method I apply my rubber dam and prepare my cavity as far as possible, then apply the nosepiece and hold the patient with nitrous oxid and oxygen until the cavity is completed. I have held a patient long enough to prepare two compound cavities in bicuspids. The drawback to this method is that the majority of patients do not like to submit to being anesthetized, and it is almost necessary to have a competent assistant to look after the anesthetic.—D. H. ZIEGLER, *Dentist's Magazine.*

DIVORCES.—May 18, Harry W. Bates, a dentist of Denver, Colo., was granted a divorce against Olive E. Bates on the grounds of extreme cruelty.—May 11, formal entry was made by Judge Walker of an order by which Mrs. Marion Thornton Egbert is to receive from Jerome W. Egbert, a dentist of Chicago, Ill., $1,500 as her traveling expenses from India to Chicago, that she may defend the divorce suit against her.—May 1, Joseph J. Johnson, a dentist of Reading, Pa., applied for a divorce against Emma R. Johnson, alleging cruelty and danger to life.—May 15, Mrs. Jennie Stahl filed a petition of divorce against J. V. Stahl, a dentist of Wooster, O., alleging unfaithfulness.

SELECTING A CROWN.—In matching all porcelain crowns the shade can be determined more accurately by examining both crown and natural teeth from the lingual aspect with the mouth mirror, while holding the crown in position in the mouth. In some cases a crown may seem to be a perfect match while looking at it from the labial side only, when, upon examination from the lingual side, there will be disclosed a distinct difference in shade. A crown should be selected having for its foundation body material of the same shade as the underlying colors in all angles of light, but will match more closely after a few years of service, when the natural teeth gradually assume a darker shade.—P. P. DORR, D.D.S., *Dental Brief.*

ANESTHESIA.—Incomplete or partial anesthesia as a cause for accidents is usually brought about in this way: A patient comes into the office and wants a tooth extracted, but cannot stand to be hurt. She wants to take just a little chloroform, not enough to put her to sleep, for then she might never wake up. She wants just enough so that she will not feel the tooth when it comes out. This simple and innocent sounding request, if complied with on our part, renders a trivial operation that would not be at all dangerous if no anesthesia was used or complete narcosis attained, extremely dangerous under imperfect anesthesia. Now, if we put this patient under complete anesthesia, all reflex action will be abolished. But, if anesthesia is incomplete or imperfect, the shock or pain from extracting a tooth may contract and arrest the heart action. At the same time the blood continues to flow into the dilated capillaries and veins, and the heart fails to maintain sufficient blood pressure to re-establish the normal arterial circulation.—A. D. KYNER, Moweaqua, Ill.—*Tri-State Record.*

ROBBERIES.—M. W. Pearson, St. Louis, Mo., May 2, $40 worth of gold.—C. L. Eller, Hedrick, Ia., May 5, $120 worth of gold and other dental material.—Drs. Brown and Paget, El Paso, Tex., May 14, gold crown. The thief, upon endeavoring to dispose of stolen article to another dentist, was placed under arrest.—A. Van Horne, Peoria, Ill., May 14, $50 worth of gold.—Boston Dentists, Lincoln, Neb., May 17, $185 worth of gold; also of the same city Dr. Miller, $15 worth of gold; E. G. Antrim, May 16, robbed; and about one week previous Dr. Shannon suffered similarly.—Dr. Rathbun, New Hampton, Iowa, May 21, $50 worth of gold.—Drs. Murlless & Beebe, Sidney, Neb., had stolen several full sets of teeth.—T. F. Boyd, Harrisburg, Pa., May 23, $20 worth of gold.—C. C. Backus, Dixon, Ill., May 24, $125.—Miss Anna Stuart, Syracuse, N. Y., $10 worth of gold and other articles.—P. J. Morton, Lincoln, Neb., May 23, $10.—W. F. Berkowitz, Manhattan, N. Y., May 25, instruments, gold etc., $1,000.

ACCIDENTS.—A. C. Searles, a dentist of Owatonna, Minn., was seriously injured through being thrown from a wagon, April 30.—Early in May, George McInnes, a dentist of Cambridge, Mass., suffered an injury to his right hand, caused by a piece of glass being blown into the flesh by an explosion.—Emmet Greene, a dental student, whilst watching some professional demonstrations at Iowa University, fell into the amphitheater and fractured his skull, but is now fully recovered.—A Milnor, N. D., dentist, named Prescott, early in May fell through a hole in the sidewalk and broke his arm.—D. C. Reynolds, a traveling salesman, on May 20, nearly lost his life by swallowing the lower set of his artificial teeth. He was conveyed from Ripon in a speedy automobile to St. Agnes' Hospital, Fond du Lac, Wis., where he received timely attention.—Harry Connors, a dentist of Atlanta, Ga., was accidentally shot in the head by reason of a revolver dropping from his pocket and so being discharged.

PYGMIES' TEETH.—Our frequent and valued contributor, Captain A. F. H. Howe, communicated recently to the Odontological Society an interesting monograph upon the dentition of the curious little African dwarfs, which, copiously illustrated, appears in the *Transactions* of the society for January.

After referring to the legends confirmed by Sir Henry Stanley in 1887, and by Sir Harry Johnston later, we are reminded of the fact that even in 1883 skulls of a kindred race were presented to the College of Surgeons by Emin Pasha. Respecting the six living specimens of pygmies lately brought to England by Colonel Harrison, four males and two females, Captain Howe has made a careful study of their mouths, and presented models to the Museum of the Odontological Society. His examination confirms the reports that the teeth of this tribe are strong and large, though they are mutilated frequently by an ancient custom. It appears, however, that there is much irregularity and abnormality, so that they are quite the reverse of beautiful. Captain Howe mentioned that Mr. Frank Farmer had anticipated him in taking models of some of the mouths. The pygmies varied in age from 18 to 35, and in height from 3 feet 9 inches to 4 feet 2 inches. It is a generalization, which careful and expert anthropological

research invariably reveals, that these types of man are not altogether free from dental pathological conditions we associate with a higher civilization.

For instance, among this small group of six individuals, there were teeth still unerupted, and others prematurely lost from becoming loose and falling out.

Also there is alveolar absorption, and deposit of soft calculus. The general appearance is that of senility, and it is said that these people rarely live beyond the age of 40.—*Jour. Brit. Dental Assoc.*

MARRIAGES.—David B. Bebout, a dentist of Amsterdam, O., was married to Miss Edna P. Burgett of Salineville, O., May 3.—Clark M. Cryor, a dentist of Dixon, Ill., was married to Miss Blanche Crawford of Franklin Grove, Ill., May 16.—Walter E. Drumheller, a dentist of Berwick, Pa., was married to Miss Grace McAnall of the same town, May 23.—Frank Edmond, a dentist of Coshocton, N. Y., was married to Miss Margaret Cotton of Arkport, N. Y., April 24.—Erle S. Harrison, a dentist of Milwaukee, Wis., was married to Miss Helen O. Small, May 29.—Emmett Heflin, a dentist of Shawnee, Okla., was married to Miss Fannie Shippey of Long Beach, Cal., May 10.—Charles Rawhouser, a dentist of Salem, Iowa, was married to Miss Minnie Oglevee of Lone Tree, May 14.—C. A. Wedge, a dentist of Canton, Ill., was married the beginning of May to Miss Gertrude Cline of the same town.—G. N. Wyman, a dentist of Lexington, Ill., was married to Miss Jessie Davis, also of Lexington, May 10.

BANDS.—This question seemed logically debatable on the ground that the presence of a band often detracted from the artistic appearance of the crown by being more or less conspicuous, and further, and more important, that it almost invariably proved to be a source of irritation which induced gingivitis and subsequent recession of the soft contiguous tissues.

The true cause of such manifestations, however, can invariably be traced to *mechanical* irritation, and it is my belief that when these conditions do present, the fault is not with the principle, but with its application.

Hence, I maintain that if the periphery of the projecting end of the root is properly and skilfully prepared—a procedure, however, which is usually performed in the most perfunctory manner—and then if a *narrow* band made of a gauge of metal sufficiently heavy to retain its given shape under the stress of fitting, is well and closely adapted to the sides of the root and allowed to pass only a *short* but *uniform* distance within the free cervical margin upon all surfaces, so as to closely follow the cervical curvature of the gum, and offer no impingement upon the peridental membrane, the presence of a band will offer no mechanical irritation, and the objections to this style of construction will thus be largely if not entirely removed.

In proportion, then, as these statements seem to be logical the employment of a band in the manner indicated is practicable and warrantable, and in a large percentage of cases will afford a type of construction which will without question offer the most permanent results.

Where it may not be so adapted, however, its employment is contra-indicated, and the adaptation of a simple plate to the end of the root will doubtless offer the next best means of conserving to this phase of the requirements.—Dr. Goslee, in *Western Dental Journal.*

Dentistry in Factories.—It is pleasing to note that employers of labor are not only retaining the services of medical men for their employes but in a few instances are also calling in the services of dental surgeons, realizing that a large amount of the work of the medical man is often frustrated by the condition of the teeth. Messrs. Peak, Frean & Co. (biscuit manufacturers), have during the last year given their employes this advantage with, we think, most satisfactory results. During the twelve months 338 patients were seen; 1,053 teeth were removed under general anesthetics and 316 under local anesthetics; 763 fillings were inserted, and 58 dentures adapted. Such figures speak volumes for the officer in charge, and the benefit thus given by the employer to the employe should encourage other firms to adopt a similar policy. The problem of the treatment of dental disease has been from time to time referred to in these columns and the importance of teaching prevention insisted on. For it is only by prevention that we can hope to deal with, in anything like a really satisfactory manner, the enormous amount of dental disease seen in the present generation. Employers of labor could do much to prevent dental disease if they would circulate among their employes the following rules for the care of the teeth:

1. The teeth must be kept clean.

2. Use a small toothbrush with stiff bristles. Use a little soap and some precipitated chalk.

3. Brush all the teeth, especially the back ones. Brush all surfaces of the teeth.

4. Clean the teeth immediately before going to bed. Take no food of any sort afterward. Clean the teeth again in the morning.

5. Clean teeth do not decay.—*The Lancet.*

Trade or Profession.—Judge Wilkes, of the Tennessee Supreme Court, is inclined to be very liberal in his construction of the state statute exempting the tools of a mechanic from seizure. In Terry v. McDaniel, 103 Tenn. 415, he held that a barber was a "mechanic," and in a dissenting opinion in the very recent case of Blackmore v. Dismukes he contends that a dentist belongs in the same category. He says:

"I do not concur in all respects with the opinion of the majority. While I agree that the dentist is a professional man, I see no good reason why he may not also be called a mechanic, if he so desires, and other mechanics do not object, so that he may have the benefit of the exemption laws. There is nothing dishonorable in the occupation of a mechanic.

"A dentist has all the tools that were ever used by any carpenter, and he uses them, and uses them all at the same time. He has saws, and hammers, and picks, and pincers, and augers, and braces, and chisels, and mallets, and if there was any other instrument ever invented or used in the

days of the Inquisition he has an approved pattern of it. He has his little buzzsaw, that with its music lulls the patient to sleep, while his drill is prospecting for some nerve that up to that time had been quiet and peaceable. Like the carpenter, he builds bridges, and makes excavations, and digs holes and fills them up again.

"I cannot conceive how anyone who has ever been under the treatment of a dentist, and survived, can ever afterward doubt that he is both a mechanic and a laboring man. No man can produce the results he does except by hard work.

"It is said that his bills are made out for 'professional services,' and that the amount of them ranks him among professional men, and not merely as a mechanic or laborer. There is great force in this suggestion; but we know that others besides professional men charge high for services. For instance, bank officials, railroad presidents and presidents of life insurance companies—so that this is not a fair criterion and test.

"While he looks to me like a professional man, and I would not call him otherwise, still I am in favor of saying, at his special request, that he is a mechanic, so as to give him the benefit of the law. He certainly cannot support himself without his tools, nor can he practice his profession. All his science and theory can't either pull or plug a tooth without instruments."—*Dental Register.*

Hollow Gold Inlays.—The matrix is formed of a piece of pure gold, No. 36 gage, burnished to fit the cavity. It may be necessary to anneal the gold several times during the burnishing process, but before the last annealing a hole should be punched in the bottom of the matrix with a plate punch, and with sharp-pointed scissors should be cut an opening large enough to admit the passing of pieces of solder. Also trim the edges so that they will extend a trifle beyond the beveled margins of the cavity. Replace in the tooth and adapt to all parts of the cavity, especially the margins, which should be perfectly burnished to place. Remove and flow a little solder around the opening on the concave side and replace in the cavity. Then, if the cavity extends to the approximal surface, use a matrix of metal the thickness of gold to be used for the contour. Take a bite in modeling compound, being sure that it fills the cavity and extends beyond the margins. At this point, if you wish to finish the case at the same sitting, remove the matrix and carve the compound to the required shape. Then burnish a piece of pure gold, No. 36 gage, over this, extending a little beyond the margins all around. Remove both contour and matrix from the cavity. Soften and take out the modeling compound. Paint a little flux on the concave surface of the contour; grasp the same with soldering pliers by the extended margin; hold with the concave side up and drop the matrix into it; with a little manipulation it will go to its place. Drop a little solder through the opening and solder the pieces together at one point, preferably near the cervical margin. The bite may then be proved by trying in the tooth. If it be all right, complete the soldering by holding in the pliers and dropping pieces of solder through the opening and passing slowly back and forth through a Bunsen flame.

This method of soldering will answer for the majority of inlays, but a very large one will require different treatment. Bend a piece of wire so that it forms a loop large enough to hold the case, and pass back and forth through the flame as before. After soldering is completed, the margins should be ground down and the final finishing done in the mouth. If it be not convenient to have the patient stay for the completion of the work, the procedure is a little different. Do not use a matrix in taking the bite; but allow the modeling compound to go between the teeth and extend over the margins. Remove the bite and matrix and run a plaster model. When this is hard, carve the modeling compound to the desired contour. Having the imprint of the opposing and approximating teeth as guides, it will not be necessary to use an articulator. The cover or contour gold is then burnished to the model and the inlay is finished as above described.—W. G. CLARK, *Dental Review.*

CHLOASMA TRAUMATICUM OF THE GINGIVAL TISSUE.—A peculiar coloring of certain portions of the mucous covering surrounding the teeth has often been noticed. As no mention is made of it in any medical or dental literature, its origin was doubtful until recently.

Three forms are seen: spear-shape, crescent-shape, and coalesced. The first follows the line of the tooth septum, the second the festoons, and the third is a combination of the two preceding forms.

Common pigmentation, as seen in warts, moles and birthmarks is always either congenital or the sequel of hyperemic conditions, associated with inflammatory and melanotic processes.

The stain came from within, and was deposited in the cells, and the protoplasm of the same through the hematin of the blood—a physiologic procedure—but may become pathological by irritation or senility, and without removal may develop into sarcoma or carcinoma.

The mechanical blurring of the skin is, in all cases, the result of external influences, either accidental or intentional. The majority of dermal specialists claim that nothing more serious is produced than disfigurement; to the latter class the subject of this paper belongs.

The casual streaking and spotting of the cervical borders and interdental spaces being unlike the characteristic purplish lines of chronic lead or silver nitrate poisoning, was supposed to have been due to ruptured capillary blood-vessels, or to atavism, as similar traits, while more extensive, are general in the mouths of negroes.

The cause was found in the cutting and laceration of the membranes by abrading disks used in polishing approximal and buccal fillings, especially amalgam; it is presumed that the debris was absorbed or driven into the injured surfaces, and after healing remained fixed.

Unfortunately, no anatomical examination has been made to verify either statement. The tinctured structures are clearly defined, circumscribed, and take their hues from the substance introduced; usually shading from yellow to bluish black, and most pronounced at the point of entrance.

Whether the inclosed or encysted foreign matter will in time excite any lesion is unknown; so far no increase, decrease, or degeneration of the

affected parts has been observed; it is certain the subject is branded for life, as all attempts to obliterate the marks by surgical or chemical means have failed.

To disfigure a pretty face or expressive countenance by the commercial use of gold crowns and bridges is unprofessional, but to mar forever, by tattooing, the ruby-tinged drapery of the oral cavity, by the negligent use of instruments, is almost criminal.—Dr. N. A. Mills, Baltimore, *Dental Cosmos.*

A Preliminary Note on the Treatment of Alveolar Osteitis (Rigg's Disease) by Means of Vaccine.—The author gives a series of long-standing cases of alveolar osteitis, in which local treatment has failed to confer permanent cure, treated by injection of staphylococcal serum.

In a few cases some reaction took place after the injection, generally before the third day; but in two cases it was delayed to the seventh and eighth days. Pain in back and head, accompanied with malaise, and but slight rise in temperature.

The local suppuration at first increased, and in cases where acne spots were present these were increased.

The reaction passed in a day or two, and in only one case recurred at the second injection.

All the cases improved, and the patients in several instances increased in weight.

Two cases of chronic pharyngitis, associated with alveolar suppuration, and a case of acute, deep acne, with oral sepsis, cleared up under treatment; and one case of chronic antral suppuration has been treated, so far, with satisfactory results.

From the results obtained he gives as his opinion:

That certain varieties of alveolar suppuration, designated alveolar osteitis, are associated with staphylococci.

That in this class the infection is more than a local one.

That injection of vaccine prepared from the organisms concerned increases the opsonic power, with an improvement in the general and local conditions.

That Wright's method applied to this class of disease opens up a new field of treatment in oral diseases, especially chronic, antral, and perhaps nasal suppuration.—Kenneth Goadby, in *British Journal of Medical Science.*